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Log # 02-08-001

HYDROLOGY & HYDRAULIC STUDY
CRISTIANO CHURCH

CALAVO DRIVE
SAN MARCOS, COUNTY OF SAN DIEGO
CALIFORNIA

Dated: March 26, 2004

COUNTY MAJOR USE PERMIT 02-002

PROJECT

Cristiano Church, Deodar and Calavo Drive, San Marcos, California

SCOPE OF WORK

The work proposed will consist of the development of the presently vacant lot with a new community church. The property is located on the corner of Calavo Drive and Deodar in the San Marcos area of the County of San Diego, California. The proposed site development will consist of an approximate 3200sf fellowship hall, an approximate 4900sf sanctuary, an approximate 6600sf parking lot adjacent to the fellowship hall, an approximate 13,370sf parking lot adjacent to the sanctuary, approximately 10,000sf of other access roads and paved surfaces and a septic field.

SITE DESCRIPTION

The subject site consists of roughly 3.8 acres of undeveloped land in the San Marcos area of the County of San Diego California. The site is presently vacant and covered with low lying grasses and tree's. The northern approximately 1/4 of the lot is overlain by high voltage SDG&E power lines, SDGE holds an easement through property in this area. The site is bounded to the north by a undeveloped lot that is presently being graded, to the east by Calavo Drive, to the south by Deodar Road and to the west a private driveway and residential dwelling. The general topography of the lot is moderately sloping (+/- 15-20%) from a high point along the western property line, to the east.

Presently the drainage onsite is sheet flow, from west to east, flowing to (2) distinct outlet points along Calavo Drive (one a south end of site, Node 12, and one at north side of Calavo Drive, Node 93). Flow at the south basin is across Calavo Drive along an aspahlt berm into an existing CMP storm drain pipe located the intersection of Calavo Drive and Deodar Road (hereafter node 12). Flow at the north drainage basin is across Calavo Drive onto the SDG&E property lying east of the site (hereafter node 93); there is a moderate amount of ponding that occurs along the east side of Calavo Drive, prior to the sheet flow over road centerline. Further there is an existing storm drain pipe, which outlets onto the SDG&E property, in the approximate location of the sheet flow, which inlets north of the property. Erosional scarring has occurred below the existing pipe, resulting in erosional gullies on the order

A private driveway flanks the western property line. The driveway is improved with AC paving and graded with a distinct inward pitch toward the cut south bank. This results in water flowing along the inside edge of the driveway, thus defining the western edge of the tributary basin.

SITE CONSTRAINTS

Tributary Area: Our analysis indicates the site is not impacted by offsite tributary flow, but uphill tributary areas are included to account for improvement upgrades of the existing CMP.

Existing CMPs exist along Calavo Drive, at both the northern and southern portion of the property. We proposed as part of this development to maintain increases of peak runoff discharges onsite, thereby not increasing peak runoff to existing facilities. We also propose in association with our proposed street improvements for a portion of Calavo Drive from the centerline to upgrade the existing CMP at the northern portion of the property with a larger 24" CMP, curb inlet and a properly sized rip rap across Calavo Drive on SDGE property.

HYDRAULIC SCOPE

Runoff will sheet flow across "pervious concrete" parking lots to grated inlets and will be collected in area drains systems. Runoff will be carried via private storm drain lines to rip rap energy dissipators, grass and/or cobble lined swales for onsite dissipation. Water runoff on slopes will be dissipated by slope vegetation. Surface slope runoff will be captured in a brow ditch, cobble lined or concrete at the top of all cut slopes.

Soil Type: Soils Type B, (see Appendix A- Hydrologic Soil Groups Map for Site; and Appendix B- Pecolation Study, prepared by Engineering Design Group, dated October 2002)

For the purpose of the this study, two type of pavements area considered. One type is typical impervious AC pavement or other paving equivalent and the other Ecocreto™ pervious concrete (see specifications attached). Buildings, sidewalks and driveways are considered impervious. Parking lots are specified for impervious concrete. The septic field area is presently undisturbed. The leach line system will be installed and the area returned to a pre-existing condition.

C pre-existing = .025
C post - buildings, sidewalks & main entries = 1.0
C post - septic area = 0.25

RUNOFF (Pre-Development)

BASIN	TRIBUTARY AREA (acres)	Q_{100} (cfs) PRIOR TO DEVELOPMENT	SOURCE OF CAPTURE
A	*2.79*	*3.77*	*Node 11*
B	*3.15*	*4.33*	*Node 93*

See attached spread sheet for Pre-Development summary

PRE-DEVELOPMENT BASIN CALCULATIONS

BASIN NO.		Q_{100} POST Development						Q_{100} TOTAL (cfs)	OUTFALL
	I (in/hr)	C	A (ac)	$Q_{IMPERV.}$ (cfs)	C	A (ac)	$Q_{PERV.}$ (cfs)		
A	5.50	1.00	0.00	0.00	0.25	2.74	3.77	3.77	Ex. 18" CMP at Calavo Dr.
B	5.50	1.00	0.00	0.00	0.25	3.15	4.33	4.33	Ex. 15" CMP at Calavo Dr.
Total			0.00	0.00		5.89	8.10	8.10	

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RUNOFF (Post Development)

BASIN (outfall basin)	TRIB. AREA (acres)	Q_{100} (cfs) PRIOR TO DEV.	Q_{100} (cfs) POST DEV.	INCREASE Q_{100} (cfs)	100 year, 6 hr Volume of Increase or Decrease from Dev. (ft^3)	SOURCE OF CAPTURE
1 (offsite - Calavo Dr)	*1.85*	*2.5*	*Unchanged*	*n/a*		*Existing 18" CMP at Calavo Drive*
2 (basins 4,5 & 6)	*0.48*	*0.66*	*2.12*	*1.46*	*2,886 ft3 Increase*	*Onsite Containment*
3 (basin1)	*0.16*	*.2*	*Unchanged*	*n/a*		*Brow ditch to Rip Rap in Basin 1*
4 (n/a)	*0.25*	*0.34*	*0.34 + storage in paving*	*n/a*	*(2,199) ft3 decrease*	*Onsite Containment*
5 (basin 6)	*0.20*	*0.55*	*2.18*	*1.63*	*3,230 ft3 Increase*	*Onsite Containment New 24 inch CMP*
6 (Offiste - Calavo Dr)	*0.5*	*0.68*	*0.68 + storage in paving*	*n/a*	*(4,466) ft3 decrease*	*Onsite Containment*
7 (basin 8)	*0.6*	*0.74*	*Unchanged*	*n/a*	*(333) ft3 storage at swale*	*Cobble Swale into Basin 8*
8	*1.5*	*2.07*	*Unchanged*	*n/a*		*Brow Ditch, then Into basin 9 then into cobble swale*
9	*0.16*	*0.22*	*Unchanged*	*n/a*	*(573) ft3 storage at swale*	*Cobble Swale - overflow to Calavo Drive*
10	*0.20*	*0.28*	*0.72*	*0.34*		*RR Basin 1*
Total	*5.9*				*(-1,455)ft3 Decrease from developement*	

See attached spread sheet for Post-Development summary

CRISTIANO CHURCH- MAJOR USE PERMIT 02-002

BASIN NO.		Q_{100} PRIOR to Development						Q_{100} TOTAL (cfs)	OUTFALL	
	I (in/hr)	C	A (ac)	$Q_{IMPERV.}$ (cfs)	C	A (ac)	$Q_{PERV.}$ (cfs)			
1	5.50	0.95	0.00	0.00	0.25	1.85	2.54	2.54		
2	5.50	0.95	0.00	0.00	0.25	0.48	0.66	0.66		
3	5.50	0.95	0.00	0.00	0.25	0.16	0.22	0.22		
4	5.50	0.95	0.00	0.00	0.25	0.25	0.34	0.34		
5	5.50	0.95	0.00	0.00	0.25	0.20	0.28	0.28		
6	5.50	0.95	0.00	0.00	0.25	0.50	0.69	0.69		
7	5.50	0.95	0.00	0.00	0.25	0.58	0.80	0.80		
8	5.50	0.95	0.00	0.00	0.25	1.51	2.08	2.08		
9	5.50	0.95	0.00	0.00	0.25	0.16	0.22	0.22		
10	5.5	0.95	0.00	0.00	0.25	0.2	0.28	0.28		
Total			0.00	0.00		5.89	8.09	7.82		

BASIN NO.		Q_{100} POST Development						Q_{100} TOTAL (cfs)	OUTFALL	Difference Q_{100} (cfs)
	I (in/hr)	C	A (ac)	$Q_{IMPERV.}$ (cfs)	C	A (ac)	$Q_{PERV.}$ (cfs)			
1	5.50	1.00	0.00	0.00	0.25	1.85	2.54	2.54	Ex. 18" CMP at Calavo Dr.	0.00
2	5.50	0.80	0.48	2.12	0.25	0.00	0.00	2.12	OC overflow to Basins 1	1.46
3	5.50	1.00	0.00	0.00	0.25	0.16	0.22	0.22	BD to RR at Basin 1	0.00
4	5.50	1.00	0.20	1.10	0.40	0.05	0.11	1.21	OC	0.87
5	5.50	1.00	0.20	1.10	0.40	0.00	0.00	1.10	OC to Basin 6	0.83
6	5.50	1.00	0.00	0.00	0.25	0.50	0.69	0.69	OC at Basin 6, overflow to CS	0.00
7	5.50	1.00	0.00	0.00	0.25	0.58	0.80	0.80	CS into Basin 8	0.00
8	5.50	1.00	0.00	0.00	0.25	1.51	2.08	2.08	BD to CS to Basin 9	0.00
9	5.50	1.00	0.00	0.00	0.25	0.16	0.22	0.22	CS, overflow at Calavo Dr.	0.00
10	5.50	0.65	0.20	0.72	0.25	0.00	0.00	0.72	RR at Basin 1	0.44
Total			1.08	4.32		4.81	6.66	10.98		3.16

Basin Definitions
1 - Septic Area
2 - Fellowship Hall & Sanctuary
3 - Above Cut Slope
4 - Ecocrete Pavement & Cut Slope
5 - Impervious Concrete Paving/Driveway
6 - Ecocrete Pavement & Cut Slope
7 - SDGE Easement
8 - North Portion of Site
9 - Northeast Portion of Site

Abbreviations	
CS	Cobble Swale
OS	Onsite Containment
BD	Brow Ditch
RR	Rip Rap
CMP	Corrugated Metal Pipe

CALCULATIONS

Watershed less than 0.5 Square Mile, use Rational Method per ***County of San Diego Hydrology Manual***
(See Orthographic Topographic Maps attached at the back of this study for watershed area.)

Q_{100} = CIA (Rational Method)

Tc = 8.8 minutes

P_6 = 3.0 inches
I_{100} = 5.5 (See attached County of San Diego Intensity Duration Chart and Storm Charts)
C (Prior to Development) = 0.25

Total Acreage = 4.69 ac
Fellow ship hall & sidewalks = 5,800 sf or 0.133 acre (impervious)
Sanctuary & sidewalks = 9,700 sf or 0.222 acre (impervious)
Ecocreto™ Parking surfaces = 19,970 sf or 0.458 acre (pervious)
Other non pervious surfaces = 10,000sf or 0.229 acre (impervious)

C (Post Development Composite Coefficient)

1.04 / 3.8 = 27.4%impervious

C = 0.95 x (0.274) + 0.25 x (1 - 0.274) = 0.44 say 0.50 composite runoff coefficient.

Because of the way the basins are being treated, each basin will be run with the appropriate C value as opposed to a composite approach.

BASIN 1 (septic area)

Description: Septic area - area will be maintained at close to natural condition. No increase in runoff in this area. All other basins drain to north into onsite containment facilities.

Offsite Tributary Area:
None, road above captures water and drains to the opposite side of the street

Onsite Tributary Area:
A=1.85 acres

RUNOFF PRIOR TO DEVELOPMENT
C=0.25 ; A =1.85 acres ; I_{100} =5.5 in/hr from County Intensity-Duration Design Chart, attached
Q onsite $_{\text{PRIOR TO DEVELOPMENT}}$ = CIA = (0.25)(5.5in/hr)(1.85 acres) = 2.5 cfs

Q onsite $_{\text{POST DEVELOPMENT}}$ = Same - unchanged

BASIN 2 (Fellowship Hall & Sanctuary)

Offsite Tributary Area:
See attached map as part of this plan

Onsite Tributary Area:
A= 0.482 acres
Imperious = 0.355 acres
Percent impervious = 0.355 / 0.482 = 0.737 or 73.7%

Composite Runoff:
C = 0.95 (0.737) + 0.25 (1 - 0.737) = 0.76 say 0.80

RUNOFF PRIOR TO DEVELOPMENT
C=0.25 ; A =0.482 acres ; I_{100} = 5.5 in/hr from County Intensity-Duration Design Chart, attached
Q onsite $_{\text{PRIOR TO DEVELOPMENT}}$ = CIA = (0.25)(5.5in/hr)(0.482 acres) = 0.66 cfs
V (Volume) = C(P_6)A acre-inches
Volume = (0.25)(0.482)(3) = 0.3615 acre-inches x 102.8 m^3/acre-inches x 35.3 ft^3/m^3 = 1,311 ft^3

RUNOFF POST DEVELOPMENT
C=0.80; A =0.482 acres ; I_{100} = 5.5 in/hr from County Intensity-Duration Design Chart, attached
Q onsite $_{\text{POST DEVELOPMENT}}$ = CIA = (0.80)(5.5in/hr)(0.482 acres) = 2.12 cfs
Volume = (.8)(.482)(3) = 1.1568 acre-inches x 102.8 m^3/acre -inch x 35.3 ft^3/m^3 = 4,197 ft^3
increase = 2,886 ft^3
Outfall - Pervious concrete Basins 4 & 6 & below grade containment

BASIN 3 (area above cut slope)

Offsite Tributary Area:
None, road above captures water and drains to the opposite side of the street

Onsite Tributary Area:
A=0.96 acres

RUNOFF PRIOR TO DEVELOPMENT
C=0.25 ; A =0.16 acres ; I_{100} =5.5 in/hr from County Intensity-Duration Design Chart, attached

Q onsite $_{\text{PRIOR TO DEVELOPMENT}}$ = CIA = (0.25)(5.5in/hr)(0.16 acres) = 0.2 cfs
Q onsite $_{\text{POST}}$ = Same - unchanged
Outfall - Basin 1 - rip rap

BASIN 4 ("Ecocreto" Pervious pavement & cut slope)

RUNOFF PRIOR TO DEVELOPMENT

C=0.25 ; A =0.245 acres ; I_{100} =5.5 in/hr from County Intensity-Duration Design Chart, attached
Q onsite $_{PRIOR\ TO\ DEVELOPMENT}$ = CIA = (0.25)(5.5in/hr)(0.245 acres) = 0.34 cfs
Q onsite $_{POST}$ = Same + storage capacity
Area of pervious concrete = 6600 sf
Use 1 thick gravel underlayment with Mirifi Wrap
Onsite storage increase = Volume of pavement x .1 (void ratio) + volume of gavel underlayment x .3 = (6600 x 0.333 x .1) + (6600 x 1 x 0.3) = **2,199 ft^3 storage capacity of pavement & gravel**
Outfall - pervious concrete

BASIN 5 (Typical Concrete Paving)

RUNOFF PRIOR TO DEVELOPMENT
C=0.25 ; A =0.2 acres ; I_{100} =5.5 in/hr from County Intensity-Duration Design Chart, attached
Q onsite $_{PRIOR\ TO\ DEVELOPMENT}$ = CIA = (0.25)(5.5in/hr)(0.2 acres) = 0.275 cfs
Volume = (.25)(.397)(3) = 0.3 acre-inches x 102.8 m^3/acre - inch x 35.3 ft^3/m3 = 1,088 ft^3

RUNOFF POST DEVELOPMENT
C=1.0; A =0.2 acres ; I_{100} = 5.5 in/hr from County Intensity-Duration Design Chart, attached
Q onsite $_{POST\ DEVELOPMENT}$ = CIA = (1.0)(5.5in/hr)(0.2 acres) = 1.1 cfs
Volume = (1)(.397)(3) = 1.19 acre-inches x 102.8 m3/acre -inch x 35.3 ft^3/m^3 = 4,318 ft^3
Increase = 3,230 ft3
Outfall - Pervious concrete of Basin 6

BASIN 6 ("Ecocreto" Pervious pavement & cut slope)

RUNOFF PRIOR TO DEVELOPMENT
C=0.25 ; A =0.493 acres ; I_{100} =5.5 in/hr from County Intensity-Duration Design Chart, attached
Q onsite $_{PRIOR\ TO\ DEVELOPMENT}$ = CIA = (0.25)(5.5in/hr)(0.493 acres) = 0.68 cfs
Q onsite $_{POST}$ = Same + storage capacity
Area of pervious concrete = 13,400 sf
Use 1 thick gravel underlayment with Mirifi Wrap
Onsite storage increase = Volume of pavement x .1 (void ratio) + volume of gavel underlayment x .3 = (13400 x 0.333 x 0.1) + 13400 x 1 x 0.3) = **4,466 ft^3 storage capacity of pavement & gravel**
Outfall - Pervious concrete

BASIN 7 (area under power line easement)

Offsite Tributary Area:
None, road above captures water and drains to the opposite side of the street

Onsite Tributary Area:
A=0.538 acres

RUNOFF PRIOR TO DEVELOPMENT
C=0.25 ; A =0.58 acres ; I_{100} =5.5 in/hr from County Intensity-Duration Design Chart, attached
Q onsite $_{PRIOR\ TO\ DEVELOPMENT}$ = CIA = (0.25)(5.5in/hr)(0.58 acres) = 0.80 cfs
Q onsite $_{POST}$ = Same - unchanged
Storage at Cobble Swale = 111 ft x 5 ft x 2 ft x (0.3void ratio) = 333 ft^3 storage
Outfall - Cobble Swale

BASIN 8 (north part of site)

Offsite Tributary Area:
Area primarily offsite at southwest part of site

Onsite Tributary Area:
A=1.51 acres

RUNOFF PRIOR TO DEVELOPMENT
C=0.25 ; A =1.51 acres ; I_{100} =5.5 in/hr from County Intensity-Duration Design Chart, attached
Q onsite $_{PRIOR\ TO\ DEVELOPMENT}$ =CIA = (0.25)(5.5in/hr)(1.51 acres) = 2.07 cfs
Q onsite $_{POST}$ = Same - unchanged
Outfall - Cobble Swale

BASIN 9 (northeast part of site)

Offsite Tributary Area:
None

Onsite Tributary Area:
A=0.16 acres

RUNOFF PRIOR TO DEVELOPMENT
C=0.25 ; A =0.16 acres ; I_{100} =5.5 in/hr from County Intensity-Duration Design Chart, attached
Q onsite $_{PRIOR\ TO\ DEVELOPMENT}$ = CIA = (0.25)(5.5in/hr)(0.16 acres) = 0.22 cfs
Q onsite $_{POST}$ = Same - unchanged
Storage at Cobble Swale = 191 ft x 5 ft x 2 ft x (0.3void ratio) = 573 ft^3 storage
Outfall - Cobble Swale & Calavo Drive

BASIN 10 (Typical Concrete Paving)

RUNOFF PRIOR TO DEVELOPMENT
C=0.25 ; A =0.2 acres ; I_{100} =5.5 in/hr from County Intensity-Duration Design Chart, attached
Q onsite $_{\text{PRIOR TO DEVELOPMENT}}$ = CIA = (0.25)(5.5in/hr)(0.2 acres) = 0.275 cfs
Volume = (.25)(.397)(3) = 0.3 acre-inches x 102.8 m^3/acre - inch x 35.3 $ft^3/m3$ = 1,088 ft^3

Composite Runoff:
C = 0.95 (0.5) + 0.25 (1 - 0.5) = 0.6 say 0.65

RUNOFF POST DEVELOPMENT
C=0.65; A =0.2 acres ; I_{100} = 5.5 in/hr from County Intensity-Duration Design Chart, attached
Q onsite $_{\text{POST DEVELOPMENT}}$ = CIA = (0.65)(5.5in/hr)(0.2 acres) = 0.72cfs
Volume = (1)(.397)(3) = 1.19 acre-inches x 102.8 m3/acre -inch x 35.3 ft^3/m^3 = 4,318 ft^3
Increase = 3,230 ft3
Outfall - Rip Rap of Basin 1

See attached spread sheet for Volumetric summary

CONCLUSIONS:

Runoff from Basins 1 & 3 (Basin A) will continue to flow to the 18 inch CMP inlet along Calavo Drive. These basins consist of natural pervious ground, and are essentially unchanged after development. The area of Basin A, which has been split to Basins 1, 2, 3, 4, 5, has been decreased from 3.2 acres to 1.96 acres, resulting in a decrease in runoff to the existing 18 inch CMP storm drain.

Basin 2 consists primarily of building rooftops and flatwork. Runoff will be directed via sheet flow across the parking areas at Basin 4, the upper parking lot, and Basin 6, the lower parking lot, constructed of pervious concrete surfaces. Specifications for Basins 4 & 6 include Ecocreto™ pervious concrete. Ecocrete™ paving and subgrade of crushed cobble aggregate serve both as storage areas for post development runoff and onsite dissipation. For the purposes of our calculations we have utilized a conservative void ratio of 0.1 for Ecocreto™ paved areas. It was modeled with a runoff coefficient of 0.25, which is also conservative.

Basin 5, which includes the upper driveway and turnaround will consist of typical AC paving or equivalent impervious surface. Runoff from Basin 5 will be directed via sheet flow to Basin 6. Basin 6 will consist of a pervious parking lot surface, providing containment for post development runoff. A storm drain inlet at the northeast corner of the lower parking lot will provide an overflow for Basin 4, and will be connected via pipe to rip rap at Basin 1.

Basin 7 is unchanged from development. Runoff from this basin is captured in a concrete brow ditch along the top of the slope and routed to a cobble lined swale, which overflows into a concrete brow ditch for Basin 8.

Volume of Increased Runoff Generated from Development - per County of San Diego Hydrology Manual

BASIN NO.	**Equation**	$V = C(P_6)A$							
	Cprior	P_6	A	Vprior(ac-in)	Vprior (cf)	Cpost	post(ac-in	Vpost (cf)	V (cf) increased
1									0
2	0.25	3.00	0.48	0.36	1312	0.80	1.16	4198	2886
3									0
4									0
5	0.25	3.00	0.10	0.08	272	1.00	0.30	1089	816
6									0
7									0
8									0
9									0
10	0.25	3.00	0.10	0.08	272	1.00	0.30	1089	816
Total									4519

Volume of Onsite Storage Containment Generated from Development

BASIN NO.	A of P (sf)	t of P (ft)	VR	A of GB (sf)	t of GB (ft)	VR	L of GB	Feeder Basins	V (cf) contained
1									0
2									0
3				10.00		0.30	55		165
4	6600	0.33	0.10	6600	1.00	0.30		Basin 2,4	2197.8
5									0
6	13400	0.33	0.10	13400	1.00	0.30		Basin 2,5,6	4462.2
7									0
8				10		0.30	111	Basin 7	333
9				10		0.30	191	Basin 7,8,9	573
10									0
Total									7731
						V (cf) runoff increase due to development			-3212

Abbreviations	**Runoff decreases due to onsite containment from the development**
A of P	Area of Pavement
t of P	Thickness of Pavement
VR	Void Ratio
SC	Storage Capacity
A of GB	Area/Cross Sectional Area of Gravel Base
L of GB	Length of Gravel Base
CS	Cobble Swale

Basin 8 is unchanged and captured by a concrete brow ditch and directed to a cobble lined swale in area 9, via storm drain. The cobble lined swale for onsite dissipation overflows to a storm drain which directs runoff to Point B.

Area 9 is partially captured by a cobble lined swale, with an overflow to the curb and gutter improvements at Calavo Drive, Node 93.

The existing CMP at the northside of the subject property, Node 93, will be removed and replaced with a new curb inlet and 24 inch CMP. The proposed 24" CMP will maintain the approximate same alignment. A rip rap energy dissipator will be added at SDGE property to prevent the existing and ongoing erosional scarring.

See the Stormwater Management Plan, prepared by Engineering Design Group for this project for Qwq.

Address of Planning Comments - Hydrology Study 2/19/03

ONSITE CONTAINMENT:

Onsite containment of increases in peak runoff discharge will occur beneath cobble lined swales, as detailed in the preliminary site grading plan and the Stormwater Management plans. Final design of onsite containment will consist of a system that will capture the peak discharge due to development, during the modeled 6 hour, 100 year storm. Subsequent to peak discharge duration contained runoff will be percolated into adjacent soils.

1. See portion of 200 scale map, included herein. Also provided a larger scale 11"X17" with flowpatterns, acreage, basins, boundary area, proposed improvements, existing improvements.
2. Pending their present review.
3. Included. It should be noted that we anticipate a SDRSD curb inlet at this location as well.
4. See spread sheet and analysis above for composite coefficients utilized.
5. See attached as part of hydraulic calculations cross section of berm, run at variable discharge and cross slope for depth of runoff along berm.

Address of Planning Comments - Drainage Study 10/03

Presently the primary area of the proposed development drains to a low spot along Calavo Drive where water accumulates at the street and along the northern property line of the subject property, within the SDGE easement. Calavo Drive is improved with a A.C. berm along the northern portion, and is unimproved along the southern portion. No downstream drainage structures presently exist, and runoff from Calavo Drive sheet flows across onto the vacant easement property owned by SDGE. See the attached photos, pages 1-4.

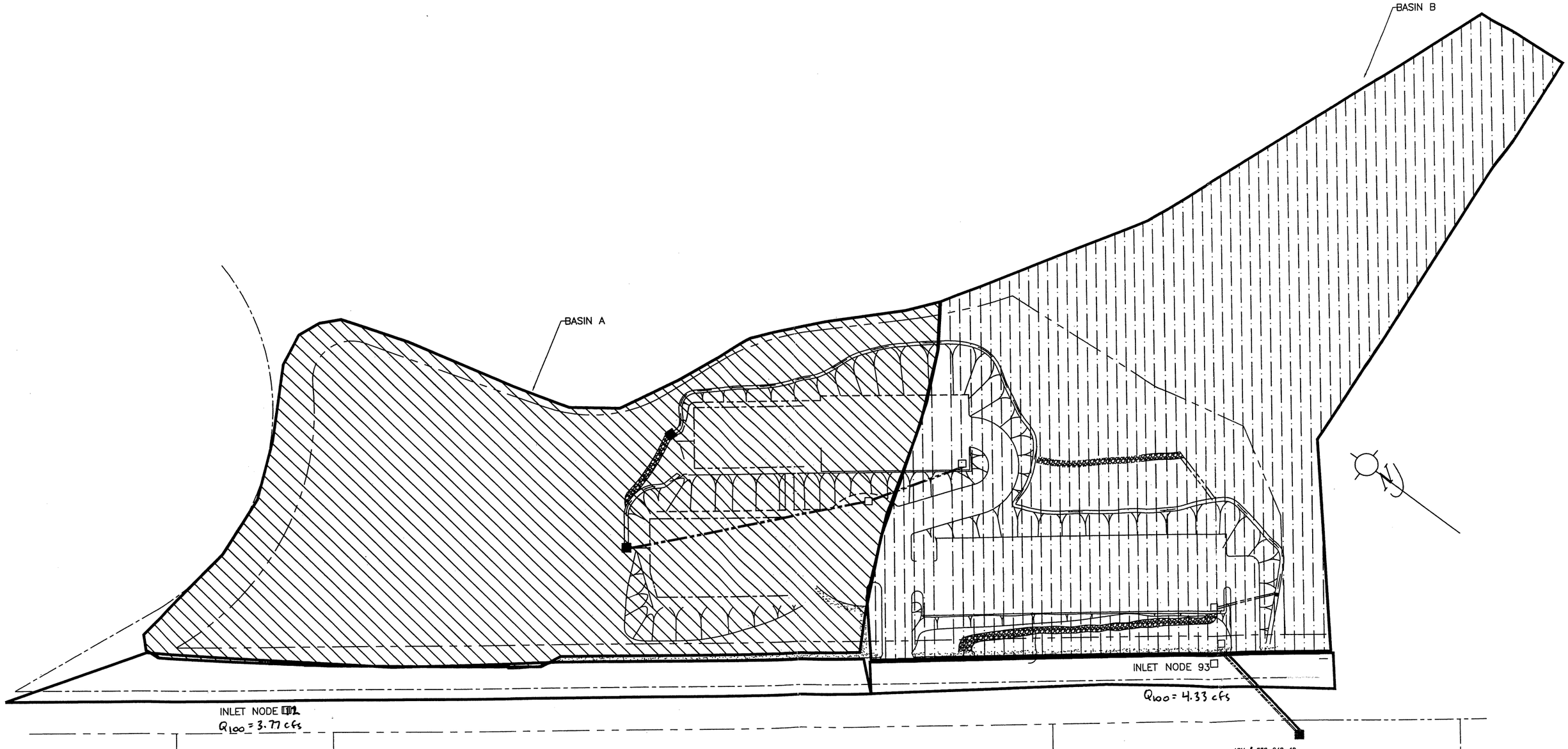
Because of the lack of stormwater infrastructure in the area, as part or the new development we propose onsite containment and infiltration into below ground soils as detailed in Detail 2 of our Stormwater Management Plan and described above under "Runoff Containment" of this report. Onsite containment has multiple benefits. It will allow development of the lot without adversely affecting any existing limited stormdrain facilities. It will also provide de-sedimentation of runoff by slowing runoff velocities to allow sediments to settle out of stormwater runoff.

In the area of the new curb and gutter along Calavo Drive, approximately 300 westerly of the northern property line, runoff from the centerline of Calavo Drive (crowning street section) will be captured by a the new curb and gutter and flow to a new curb inlet, feeding a new 24 inch CMP pipe that will run beneath Calavo Drive to a SDRSD D-40 rip rap energy dissipator within the SDGE easement. We are in the process of obtaining approval from SDGE.

MAPS

200 SCALE MAP

PRE-DEVELOPMENT BASINS



1.51 Acres

(11) Node Number

Watershed Boundary

Basin Boundary

Flow Pattern

Onsite Containment Flow

BASIN 1

BASIN 2

BASIN 3

BASIN 4

BASIN 5

BASIN 6

BASIN 7

BASIN 8

BASIN 9

1.82

0.15

0.25

0.20

0.48

0.20

0.74

1.51

0.49

0.16

sheet flow

brow ditch

cobble swale

pipe flow

Q100=1.3 cfs

sheet flow on pervious conc.

Q100=0.74 cfs

Q100=2.0 cfs

Q100=2.2 cfs

Q100=4.0 cfs

Q100=4.5 cfs

Q100=4.33 cfs

Q100=3.77 cfs

EXISTING EARTHEN BERM WITH ASPALT TOPPING TO REMAIN

EXISTING 18" CMP, TO REMAIN

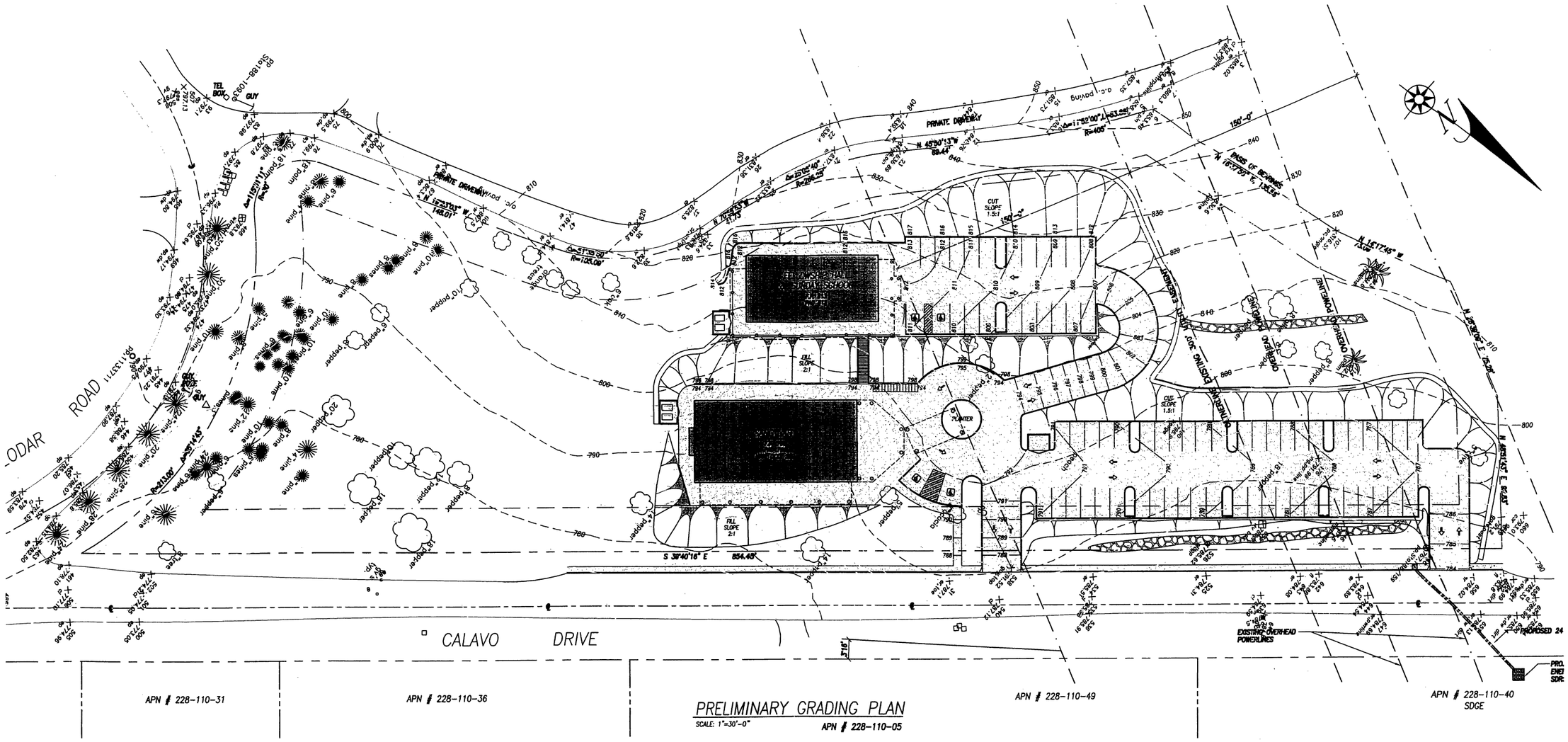
EXISTING 18" CMP, TO BE REMOVED AND REPLACED

PROPOSED 24" CMP

PROPOSED RIP RAP ENERGY DISSIPATOR PER SDRSD D-40

APN # 228-040-42 SDGE

STORMWATER MANAGEMENT PLAN



PRELIMINARY GRADING PLAN

SCALE: 1"=30'-0"

APN # 228-110-05

APN # 228-110-31

APN # 228-110-36

APN # 228-110-49

APN # 228-110-40
SDGE

CALAVO DRIVE

PROPOSED 24

EXISTING OVERHEAD POWERLINES

PROPOSED CUT: 12,200 CU. YDS.
PROPOSED FILL: 2,725 CU. YDS.
PROPOSED EXPORT: 9,475 CU. YDS.

PROJECT NOTES

TOPOGRAPHIC SURVEY MAP
OF A PORTION OF LOTS 7 AND LOT 8 IN BLOCK 6, OF MAP NO. 806, FILED IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, DECEMBER 21, 1895.

BASIS OF BEARINGS;
THE BASIS OF BEARINGS FOR THIS SURVEY IS A PORTION OF THE EASTERLY LINE OF RECORD OF SURVEY MAP NO. 9868, AS SHOWN HEREON, BEING; N 6°37'58" W.

BENCH MARK:
THE BENCH MARK FOR THIS SURVEY IS EM#429, CITY OF ESCONDIDO, @ ROCK SPRINGS ROAD AND PLEASANT HILLS ST, CHISLED SQUARE IN TOP OF CURB @ SIDEWALK UNDERDRAIN; ELEVATION=670.00

NOTES

1. WORK WITHIN EASEMENTS WILL REQUIRE LETTER OF PERMISSION FROM THE EASEMENT HOLDERS.
2. 1.5 : 1 CUT SLOPES GREATER THAN 15 FEET IN HEIGHT WILL REQUIRE SLOPE CERTIFICATIONS FROM A SOILS ENGINEER AND LANDSCAPE ARCHITECT PER THE COUNTY GRADING ORDINANCE.
3. "THIS PLAN IS PROVIDED TO ALLOW FOR FULL AND ADEQUATE DISCRETIONARY REVIEW OF A PROPOSED DEVELOPMENT PROJECT. THE PROPERTY OWNER ACKNOWLEDGES THAT ACCEPTANCE OR APPROVAL OF THIS PLAN DOES NOT CONSTITUTE AN APPROVAL TO PERFORM ANY GRADING SHOWN HEREON, AND AGREES TO OBTAIN VALID GRADING PERMISSIONS BEFORE COMMENCING SUCH ACTIVITY."
4. ALL WORK INCLUDING TREE PLANTING WITHIN THE COUNTY RIGHT OF WAY WILL REQUIRE AN ENCROACMENT PERMIT FROM THE DEPARTMENT OF PUBLIC WORKS.

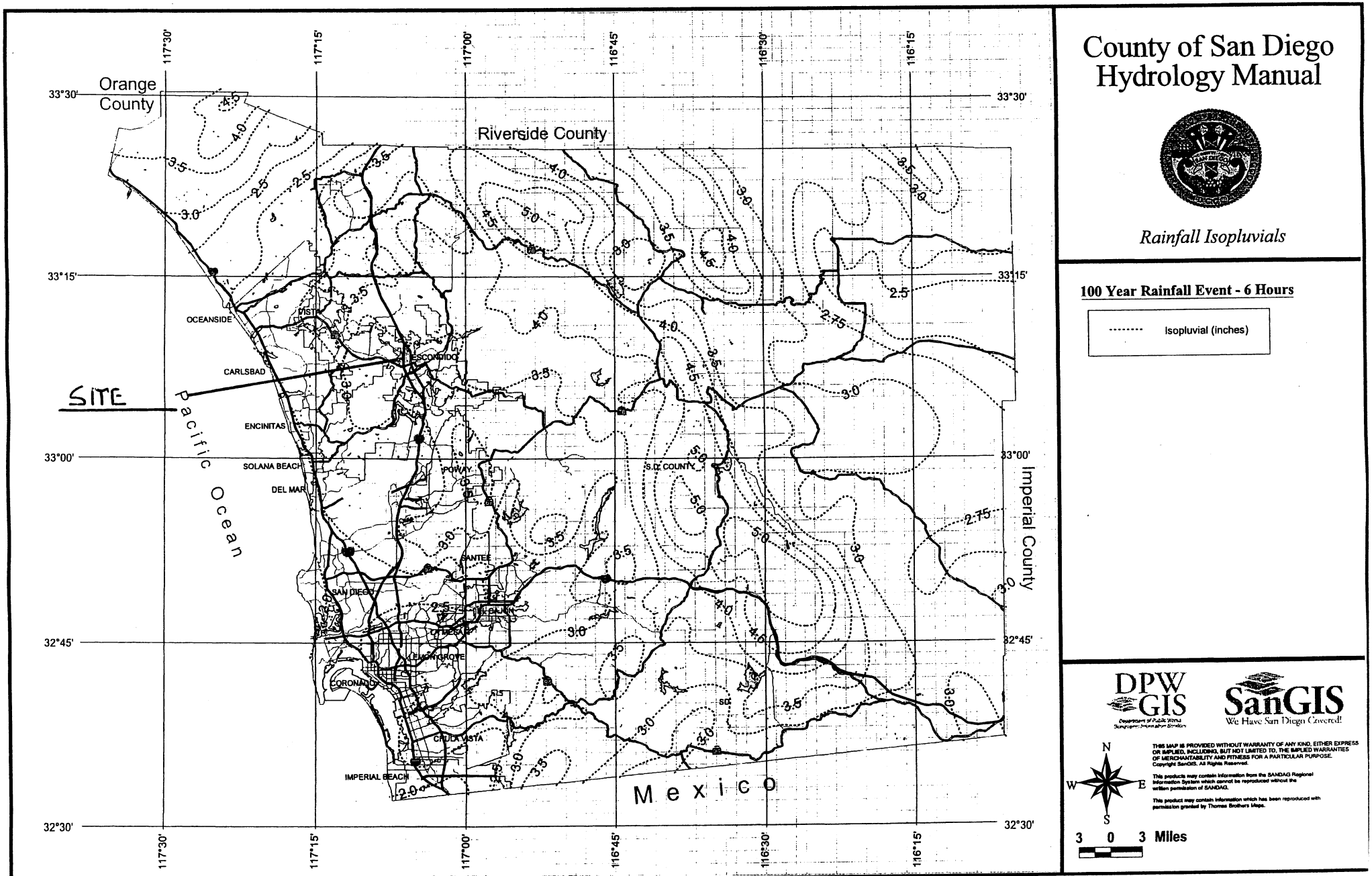
PROJECT OWNER:
CHRISTIAN CENTER HOUSE OF PRAYER
428 SUNRISE DRIVE
VISTA, CALIFORNIA, 92084
PASTOR: ALEXANDER G. BAZAN
(760) 945-3412

PROJECT ARCHITECT:
ENGINEERING DESIGN GROUP
2121 MONTIEL ROAD
SAN MARCOS, CALIFORNIA, 92069
(760) 839-7302
DONALD SPRANKLES

PROJECT CIVIL ENGINEER:
ENGINEERING DESIGN GROUP
2121 MONTIEL ROAD
SAN MARCOS, CALIFORNIA, 92069
(760) 839-7302
DONALD SPRANKLES

PROJECT SURVEYOR:
DRESSELHAUS SURVEYING
31034 VALLEY CENTER ROAD
SAN MARCOS, CALIFORNIA, 92082
(760) 749-8840, (760) 749-8730 FAX

HYDROLOGY



County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

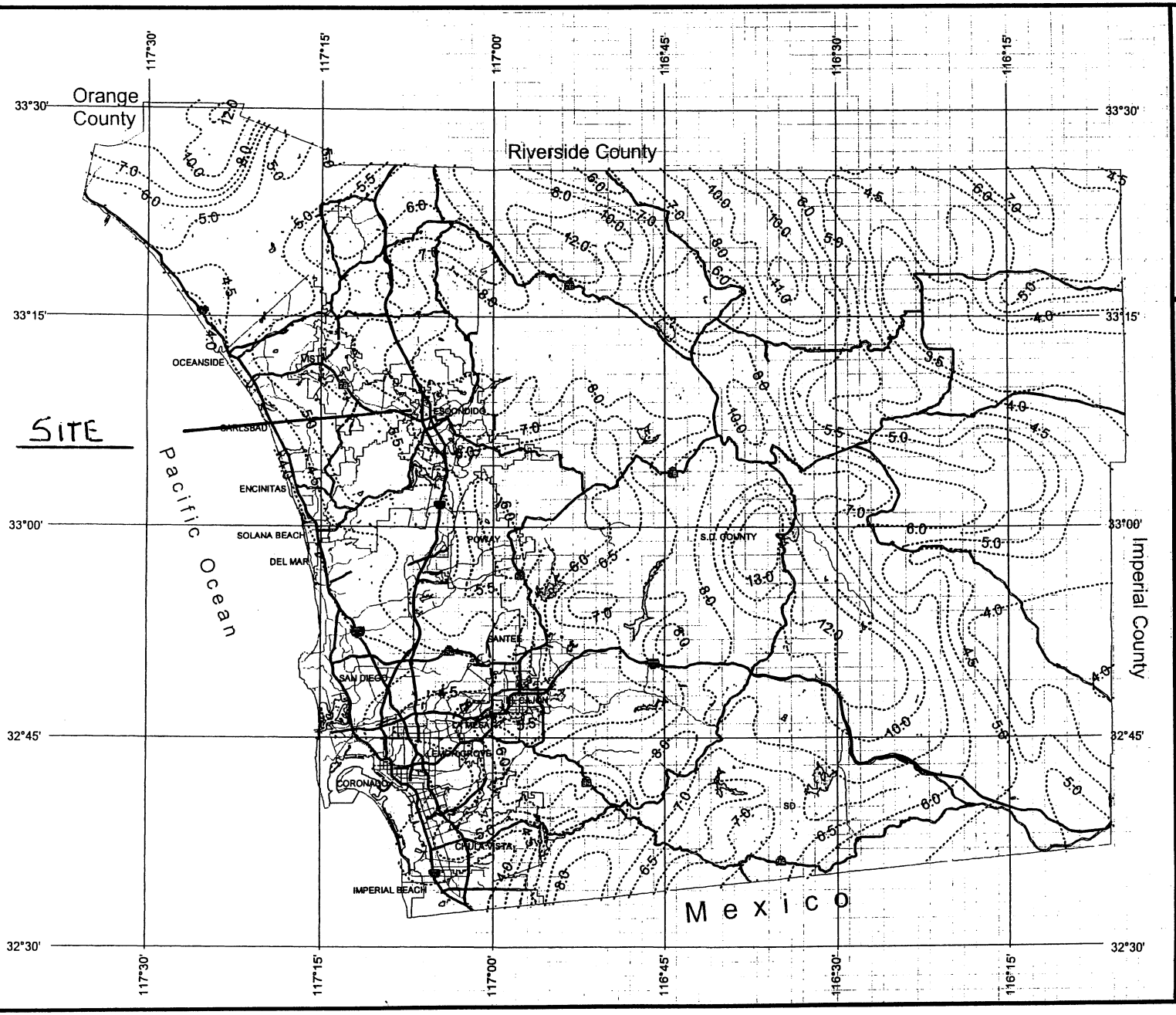
Isopluvial (inches)

DPW GIS
Department of Public Works
Surveyor / Mapping Division

SanGIS
We Have San Diego Covered!

N W E S

3 0 3 Miles



County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

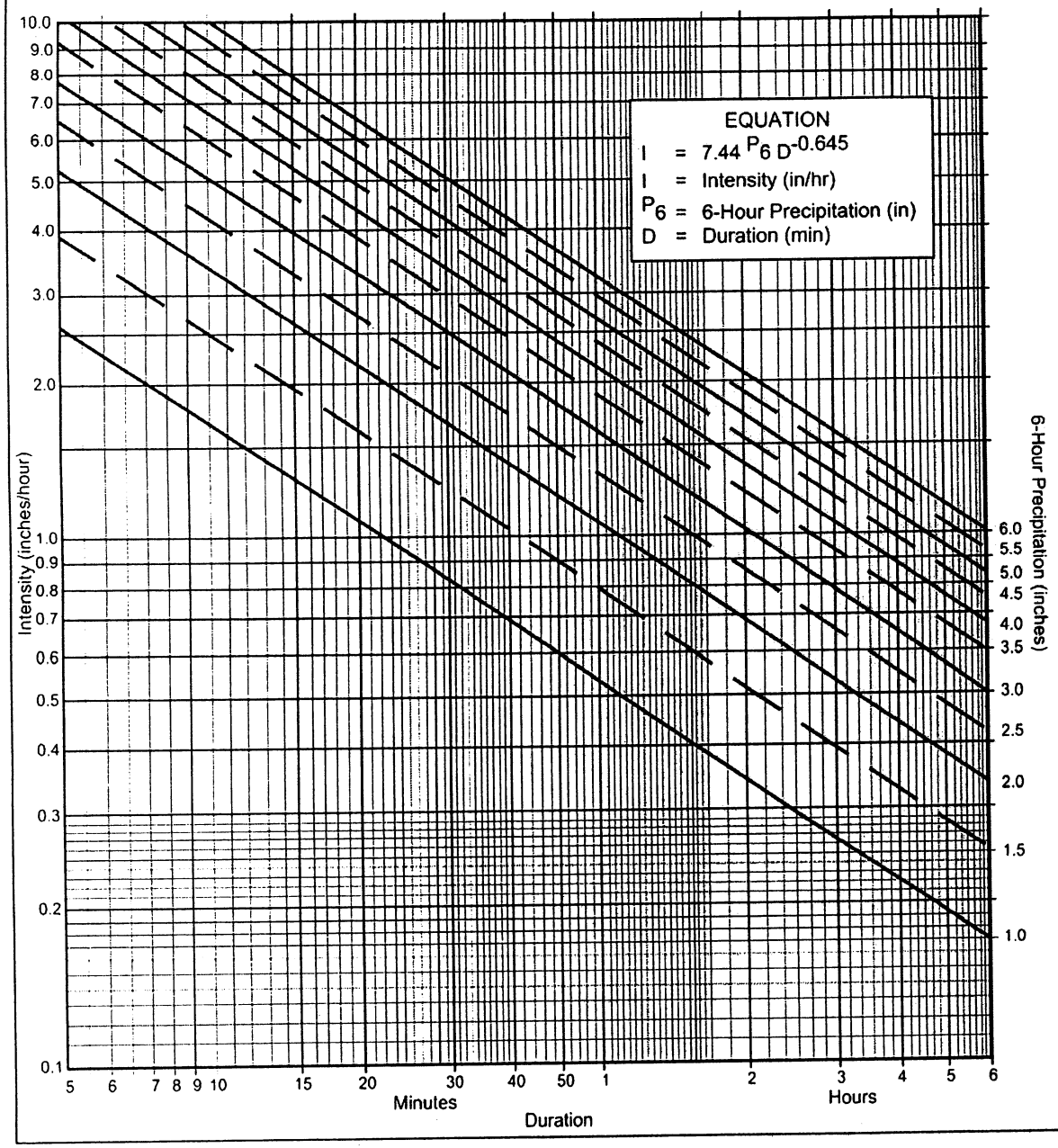
Isopluvial (inches)

DPW GIS

SanGIS
We Have San Diego Covered!

N W E S

3 0 3 Miles



Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicaple to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency _____ year

(b) P_6 = 3.0 in., P_{24} = 6.0, $\frac{P_6}{P_{24}}$ = 50 %(2)

(c) Adjusted P_6(2) = 3.0 in.

(d) t_x = 8.8 min.

(e) I = 5.5 in./hr.

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6 / Duration	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

FIGURE 3-1

HYDRAULICS

Cross Slope vs. Discharge vs. Depth
Rating Table for Triangular Channel

Project Description	
Project File	c:\haestad\fmw\cristian.fm2
Worksheet	Berm at Calavo Dr.
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Constant Data	
Mannings Coefficient	0.013
Channel Slope	0.010000 ft/ft
Right Side Slope	1.500000 H : V

Input Data				
	Minimum	Maximum	Increment	
Left Side Slope	20.000000	100.000000	10.000000 H : V	
Discharge	3.00	10.00	1.00	cfs

Rating Table

Discharge (cfs)	Left Side Slope (H : V)	Depth (ft)	Velocity (ft/s)
3.00	20.000000	0.30	3.17
3.00	30.000000	0.26	2.89
3.00	40.000000	0.23	2.70
3.00	50.000000	0.21	2.56
3.00	60.000000	0.20	2.45
3.00	70.000000	0.19	2.36
3.00	80.000000	0.18	2.29
3.00	90.000000	0.17	2.22
3.00	100.000000	0.17	2.16
4.00	20.000000	0.33	3.41
4.00	30.000000	0.29	3.10
4.00	40.000000	0.26	2.90
4.00	50.000000	0.24	2.75
4.00	60.000000	0.22	2.63
4.00	70.000000	0.21	2.54
4.00	80.000000	0.20	2.46
4.00	90.000000	0.19	2.39
4.00	100.000000	0.18	2.33
5.00	20.000000	0.36	3.60
5.00	30.000000	0.31	3.28
5.00	40.000000	0.28	3.07
5.00	50.000000	0.26	2.91
5.00	60.000000	0.24	2.78

Cross Slope vs. Discharge vs. Depth
Rating Table for Triangular Channel

Rating Table

Discharge (cfs)	Left Side Slope (H : V)	Depth (ft)	Velocity (ft/s)
5.00	70.000000	0.23	2.68
5.00	80.000000	0.22	2.60
5.00	90.000000	0.21	2.52
5.00	100.000000	0.20	2.46
6.00	20.000000	0.38	3.77
6.00	30.000000	0.33	3.44
6.00	40.000000	0.30	3.21
6.00	50.000000	0.28	3.04
6.00	60.000000	0.26	2.91
6.00	70.000000	0.24	2.81
6.00	80.000000	0.23	2.72
6.00	90.000000	0.22	2.64
6.00	100.000000	0.21	2.57
7.00	20.000000	0.41	3.92
7.00	30.000000	0.35	3.57
7.00	40.000000	0.32	3.34
7.00	50.000000	0.29	3.16
7.00	60.000000	0.27	3.03
7.00	70.000000	0.26	2.92
7.00	80.000000	0.25	2.82
7.00	90.000000	0.24	2.74
7.00	100.000000	0.23	2.67
8.00	20.000000	0.43	4.05
8.00	30.000000	0.37	3.69
8.00	40.000000	0.33	3.45
8.00	50.000000	0.31	3.27
8.00	60.000000	0.29	3.13
8.00	70.000000	0.27	3.02
8.00	80.000000	0.26	2.92
8.00	90.000000	0.25	2.84
8.00	100.000000	0.24	2.77
9.00	20.000000	0.45	4.17
9.00	30.000000	0.39	3.80
9.00	40.000000	0.35	3.55
9.00	50.000000	0.32	3.37
9.00	60.000000	0.30	3.22
9.00	70.000000	0.28	3.11
9.00	80.000000	0.27	3.01
9.00	90.000000	0.26	2.92
9.00	100.000000	0.25	2.85
10.00	20.000000	0.47	4.28
10.00	30.000000	0.40	3.90
10.00	40.000000	0.36	3.65
10.00	50.000000	0.34	3.46

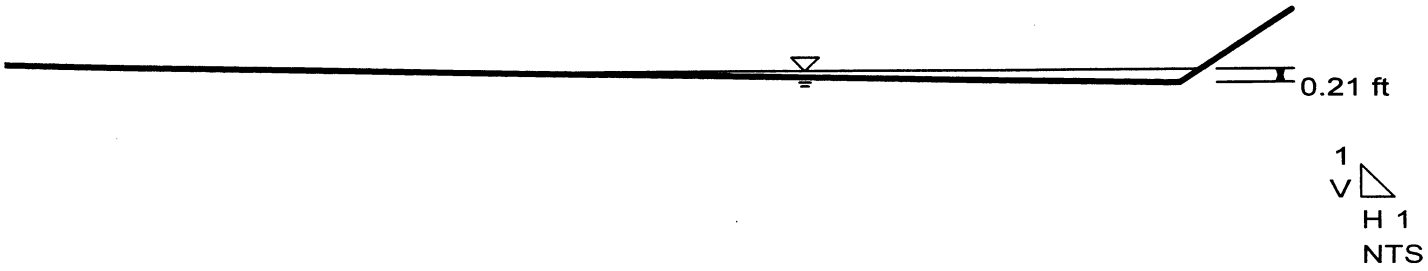
Cross Slope vs. Discharge vs. Depth
Rating Table for Triangular Channel

Rating Table			
Discharge (cfs)	Left Side Slope (H : V)	Depth (ft)	Velocity (ft/s)
10.00	60.000000	0.31	3.31
10.00	70.000000	0.30	3.19
10.00	80.000000	0.28	3.09
10.00	90.000000	0.27	3.00
10.00	100.000000	0.26	2.92

Berm Cross Section
Cross Section for Triangular Channel

Project Description	
Project File	c:\haestad\fmw\cristian.fm2
Worksheet	Berm at Calavo Dr.
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.013	
Channel Slope	0.010000	ft/ft
Depth	0.21	ft
Left Side Slope	50.000000	H : V
Right Side Slope	1.500000	H : V
Discharge	3.00	cfs



Berm at Calavo Drive
Worksheet for Triangular Channel

Project Description	
Project File	c:\haestad\fmw\cristian.fm2
Worksheet	Berm at Calavo Dr.
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.010000	ft/ft
Left Side Slope	50.000000	H : V
Right Side Slope	1.500000	H : V
Discharge	3.00	cfs

Results		
Depth	0.21	ft
Flow Area	1.17	ft^2
Wetted Perimeter	11.05	ft
Top Width	10.99	ft
Critical Depth	0.24	ft
Critical Slope	0.005014	ft/ft
Velocity	2.56	ft/s
Velocity Head	0.10	ft
Specific Energy	0.32	ft
Froude Number	1.38	
Flow is supercritical.		

DIA v. DISCHARGE, VELOCITY, SLOPE
Rating Table for Circular Channel

Project Description	
Project File	c:\haestad\fmw\cristian.fm2
Worksheet	SDGE SD
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Constant Data	
Mannings Coefficient	0.024
Discharge	17.33 cfs

Input Data	Minimum	Maximum	Increment
Channel Slope	0.020000	0.060000	0.010000 ft/ft
Diameter	18.00	30.00	3.00 in

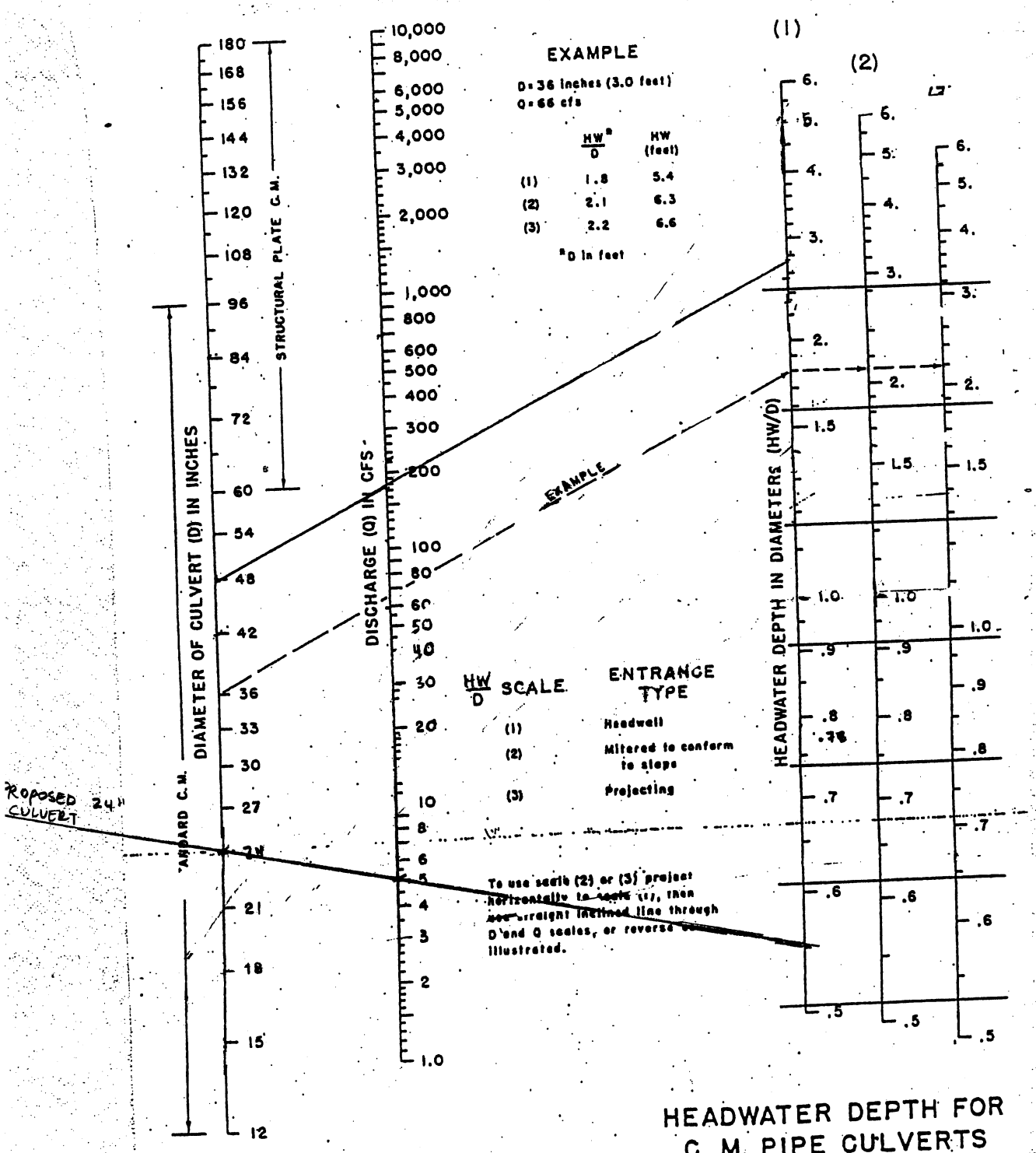
Rating Table

Diameter (in)	Channel Slope (ft/ft)	Depth (ft)	Velocity (ft/s)
18.00	0.020000	N/A	0.00
18.00	0.030000	N/A	0.00
18.00	0.040000	N/A	0.00
18.00	0.050000	N/A	0.00
18.00	0.060000	N/A	0.00
21.00	0.020000	N/A	0.00
21.00	0.030000	N/A	0.00
21.00	0.040000	1.45	8.13
21.00	0.050000	1.30	9.03
21.00	0.060000	1.21	9.76
24.00	0.020000	1.64	6.29
24.00	0.030000	1.37	7.53
24.00	0.040000	1.24	8.46
24.00	0.050000	1.15	9.23
24.00	0.060000	1.09	9.90
27.00	0.020000	1.43	6.51
27.00	0.030000	1.25	7.63
27.00	0.040000	1.15	8.51
27.00	0.050000	1.07	9.25
27.00	0.060000	1.02	9.89
30.00	0.020000	1.33	6.56
30.00	0.030000	1.18	7.63
30.00	0.040000	1.08	8.49
30.00	0.050000	1.02	9.22

DIA v. DISCHARGE, VELOCITY, SLOPE
Rating Table for Circular Channel

Rating Table

Diameter (in)	Channel Slope (ft/ft)	Depth (ft)	Velocity (ft/s)
30.00	0.060000	0.97	9.85



HEADWATER DEPTH FOR C. M. PIPE CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

$HW = 0.55 \times 2' = 1.1$ ft

Discharge v. Slope
Rating Table for Circular Channel

Project Description	
Project File	c:\haestad\fmw\cristian.fm2
Worksheet	Basin 4 & 1 - EXISTING CMP
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Capacity

Constant Data	
Mannings Coefficient	0.024
Diameter	18.00 in

Input Data			
	Minimum	Maximum	Increment
Channel Slope	0.010000	0.100000	0.005000 ft/ft

Rating Table

Channel Slope (ft/ft)	Depth (ft)	Discharge (cfs)	Velocity (ft/s)	
0.010000	1.50	5.69	3.22	
0.015000	1.50	6.97	3.94	
0.020000	1.50	8.05	4.55	DISCHARGE FOR EX. & PRP RUNOFF BASIN
0.025000	1.50	9.00	5.09	
0.030000	1.50	9.85	5.58	
0.035000	1.50	10.64	6.02	
0.040000	1.50	11.38	6.44	
0.045000	1.50	12.07	6.83	
0.050000	1.50	12.72	7.20	
0.055000	1.50	13.34	7.55	
0.060000	1.50	13.94	7.89	
0.065000	1.50	14.51	8.21	
0.070000	1.50	15.05	8.52	
0.075000	1.50	15.58	8.82	
0.080000	1.50	16.09	9.11	
0.085000	1.50	16.59	9.39	
0.090000	1.50	17.07	9.66	
0.095000	1.50	17.54	9.92	
0.100000	1.50	17.99	10.18	

Rock Channel
Worksheet for Trapezoidal Channel

Project Description	
Project File	c:\haestad\fmw\cristian.fm2
Worksheet	Rock Channel
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Equal Side Slopes

Input Data		
Mannings Coefficient	0.035	
Channel Slope	0.015	ft/ft
Depth	1.00	ft
Bottom Width	1.00	ft
Discharge	4.50	cfs

Results		
Left Side Slope	0.0e0	H : V
Right Side Slope	0.0e0	H : V
Flow Area	1.46	ft²
Wetted Perimeter	3.20	ft
Top Width	1.92	ft
Critical Depth	0.76	ft
Critical Slope	0.038628	ft/ft
Velocity	3.08	ft/s
Velocity Head	0.15	ft
Specific Energy	1.15	ft
Froude Number	0.62	
Flow is subcritical.		

Sides v. Slope
Rating Table for Trapezoidal Channel

Project Description	
Project File	c:\haestad\fmw\cristian.fm2
Worksheet	Rock Channel
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Equal Side Slopes

Constant Data	
Mannings Coefficient	0.035
Bottom Width	1.00 ft
Discharge	4.50 cfs

Input Data			
	Minimum	Maximum	Increment
Channel Slope	0.010	0.020	0.005 ft/ft
Depth	0.30	1.00	0.10 ft

Rating Table

Depth (ft)	Channel Slope (ft/ft)	Left Side Slope (H : V)	Right Side Slope (H : V)	Velocity (ft/s)	Top WIDTH
0.30	0.010	37	37	1.23	
0.30	0.015	30	30	1.52	
0.30	0.020	25	25	1.76	
0.40	0.010	16	16	1.52	
0.40	0.015	12	12	1.88	
0.40	0.020	10	10	2.19	
0.50	0.010	8	8	1.80	
0.50	0.015	6	6	2.24	
0.50	0.020	5	5	2.62	
0.60	0.010	4	4	2.07	
0.60	0.015	3	3	2.58	
0.60	0.020	2	2	3.01	
0.70	0.010	3	3	2.32	
0.70	0.015	2	2	2.86	5.10
0.70	0.020	1	1	3.29	
0.80	0.010	2	2	2.51	
0.80	0.015	1	1	3.03	
0.80	0.020	1	1	3.42	3.66 ft.
0.90	0.010	1	1	2.61	
0.90	0.015	1	1	3.09	
0.90	0.020	1	1	3.44	
1.00	0.010	1	1	2.65	3.7 ft.
1.00	0.015	0.0e0	0.0e0	3.08	
1.00	0.020	0.0e0	0.0e0	3.40	

8 inch Full Capacity
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\cristian.fm2
Worksheet	8 inch PVC
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.009	
Channel Slope	0.020000	ft/ft
Depth	0.60	ft
Diameter	8.00	in

Results		
Discharge	2.63	cfs
Flow Area	0.33	ft²
Wetted Perimeter	1.67	ft
Top Width	0.40	ft
Critical Depth	0.65	ft
Percent Full	90.00	
Critical Slope	0.020273	ft/ft
Velocity	7.95	ft/s
Velocity Head	0.98	ft
Specific Energy	1.58	ft
Froude Number	1.54	
Maximum Discharge	2.66	cfs
Full Flow Capacity	2.47	cfs
Full Flow Slope	0.022718	ft/ft
Flow is supercritical.		

12 inch Pipe Discharge
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\cristian.fm2
Worksheet	10 inch Pipe
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.009	
Channel Slope	0.020000	ft/ft
Depth	0.80	ft
Diameter	12.00	in

Results		
Discharge	7.11	cfs
Flow Area	0.67	ft^2
Wetted Perimeter	2.21	ft
Top Width	0.80	ft
Critical Depth	0.98	ft
Percent Full	80.00	
Critical Slope	0.016998	ft/ft
Velocity	10.56	ft/s
Velocity Head	1.73	ft
Specific Energy	2.53	ft
Froude Number	2.03	
Maximum Discharge	7.83	cfs
Full Flow Capacity	7.28	cfs
Full Flow Slope	0.019109	ft/ft
Flow is supercritical.		

Table
Rating Table for Circular Channel

Project Description	
Project File	c:\haestad\fmw\cristian.fm2
Worksheet	10 inch Pipe
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Mannings Coefficient	0.009
Depth	0.80 ft
Diameter	12.00 in

Input Data			
	Minimum	Maximum	Increment
Channel Slope	0.010000	0.100000	0.010000 ft/ft

Rating Table

Channel Slope (ft/ft)	Discharge (cfs)	Velocity (ft/s)
0.010000	5.03	7.47
0.020000	7.11	10.56
0.030000	8.71	12.93
0.040000	10.06	14.94
0.050000	11.25	16.70
0.060000	12.32	18.29
0.070000	13.31	19.76
0.080000	14.23	21.12
0.090000	15.09	22.40
0.100000	15.91	23.61

PERCOLATION RATE

COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC HEALTH

SEPTIC TANK INSTALLATION REPORT
SOIL CONDITIONS OF TRENCH OR SEEPAGE PIT
PERCOLATION TEST

DEPARTMENT USE ONLY
Issue permit ☐ Yes ☐ No
Final parcel map required: ☐ Yes ☐ No
Sanitarian: _____
Date: _____

Date October 8, 2002

OWNER'S NAME Centro Cristiano Alexander Bazan, Pastor ADDRESS 428 Sunrise Drive Vista, CA 92084 (760)945-341

CONTRACTOR _____ ADDRESS _____

Legal Location APN 228-110-05 Lot _____ Block _____

Test Location N/W Corner of Deodar and Calavo Drives
(NUMBER, STREET AND TOWN)

THIS REPORT WILL NOT BE REVIEWED UNTIL THE FOLLOWING INFORMATION IS ATTACHED:

1. Lot Location (locate by street)
2. Existing and Proposed Structures
3. Surfaced Areas
4. Lot Grade
5. Wells
6. Utility Water Lines
7. Test Holes
8. Sub-Surface Disposal System
9. Cuts and Fill
10. All calculations on 8½ X 11" Sheet

SUB-SURFACE DRAINAGE

PERCOLATION TEST		TEST	DEPTH OF HOLE	TIME FOR H_2O	SAFETY FACTOR	TIME/INCH	AVE. TIME/IN.
Last two readings shall not vary more than 10%	1.						17 Min./in.
	2.		SEE ATTACHED				
	3.						
	4.						

LEACHING SEEPAGE PITS – Provide soils log and calculations on 8½ X 11" sheet

DEPTH	COARSE SAND OR GRAVEL	FINE SAND	SANDY LOAM OR SANDY CLAY	CLAY WITH CONSIDERABLE SAND OR GRAVEL	EFFECTIVE ABSORP. AREA

TYPE OF SOIL: Give specific information (clay-adobe-decomposed granite, etc.)

Surface: Loam

1 ft. below surface: Decomposed Granite

2 ft. below surface Decomposed Granite

3 ft. below surface: Decomposed Granite

8 to 10 ft. below surface Decomposed Granite

Source of water Vista Irrigation District Depth of water table No water at 20 feet

Proposed structure: No. _____ Type Church

No. of bedrooms: _____, and/or maximum capacity: 288 Persons

RECOMMENDATIONS:

Size tank 1500 gal.
Drainage tile 1583 ft.
Trench width 1.5 ft.
Trench depth 5 ft.
Seepage pit width _____ ft.
Seepage pit depth _____ ft.

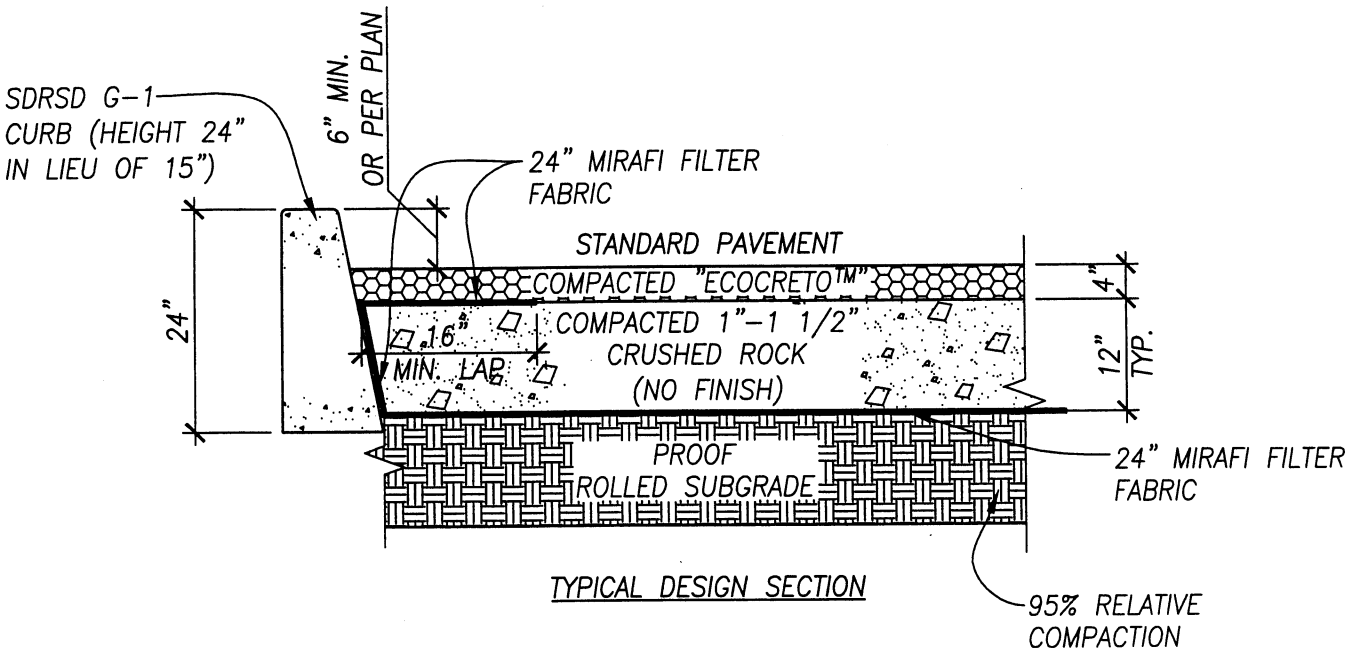
I have reviewed this percolation data and design of the subsurface sewage disposal system for this parcel and find the data and design to be accurate and in compliance with the State and local regulations and good engineering practices

(STEVEN NORRIS) 47672
REGISTERED ENGINEER (REG. NO.)

2121 Montiel, San Marcos CA 92069 12/4/02
Address Phone Date

N 73 (Rev. 11-77)

ECOCRETO™



ECOCRETO™ PERVIOUS CONCRETE PAVEMENT SECTION

X

NOT TO SCALE

ECOCRETO™ of Texas, Inc.

Recommended Specifications for

ECOCRETO™* Pervious Concrete

Version - 1.0

Forward

The **ECOCRETO™* Pervious Pavement System** has been recognized internationally as a method to meet water quality standards. We have found the largest demand is in the parking area paving. This abbreviated specification is presented as a recommended guide for all traffic loads.

Traditional Portland cement pavement testing procedures based on strength, air content and slump control are not applicable to this type of pavement material. As continued testing of this product yields test methods that are reproducible in the field, these recommended specifications will be modified.

* Patent Pending 09/902,045

ECOCRETO™ of Texas, Inc. 9200 IH-35 South, Suite #C-3, Austin, Texas 78748
Telephone 512.292.7564 Fax 512.280.4707 Toll Free 866.ECOCRETO

1.0 GENERAL PROVISIONS

1.1 Scope of work:

The work to be completed under this contract includes the furnishing of all labor, materials and equipment necessary for the construction of the proposed improvements in conformance with the plans and specifications.

1.2 References:

A. American Society of Testing and Materials

1. ASTM C 29, Test for Unit Weight and Voids in Aggregate.
2. ASTM C 33, Specifications for Concrete Aggregates
3. ASTM C 39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
4. ASTM C 42, Test Methods for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
5. ASTM C 78, Standard Test Method for Flexural of Concrete (Using Simple Beam with Third-Point Loading)
6. ASTM C 117, Test Method for Material Finer than 75 um (No. 200) Sieve in Mineral Aggregates by Washing.
7. ASTM C 138, Test Method for Unit Weight, Yield and Air Content (Gravimetric) of concrete
8. ASTM C 140, Methods of Sampling and Testing Concrete Masonry Units
9. ASTM C 150, Specifications for Portland Cement (Type I or II only)
10. ASTM C 172, Practice of Sampling Fresh Concrete
13. ASTM C 595, Specifications for Blended Hydraulic Cements (Types IP OR is only)
14. ASTM C 618, Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
15. ASTM C 944, Standard Test Method for Abrasion Resistance of Concrete or Mortar Surfaces by the Rotating Cutter Method
16. ASTM C 989, Specification for Ground Granulated Blast Furnace Slag for Use in Concrete and Mortars
17. ASTM C 1077, Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
18. ASTM D 448, Specification for Standard Sizes of Coarse Aggregates for Highway Construction
19. ASTM D 1157, Tests for Moisture-Density Relations of Soils and a Soil Aggregate Mixture Using 10 Pound Rammer and 18-inch Drop
20. ASTM D 4700-91 Guide for Soil Sampling from the Vadose Zone

B. American Association of State Highway and Transportation Officials (AASHTO)

1. AASHTO T-180, Moisture-Density Relations of Soils Using a 10-Pound (454kg) Rammer and an 18-inch (457mm) Drop
2. Texas Department of Transportation (TXDOT) Standard Specifications for Construction of Roads and Bridges

1.3 Contractor Qualifications:

The use of an Ecocreto™ Certified Installer is a requirement. Prior to award of the contract, the placing contractor shall furnish owner/engineer/architect a statement attesting to qualifications and demonstrating experience with the following concrete procedures and tests:

1. A minimum of two (2) completed projects with addresses
2. Measuring unit weight acceptance data
3. Conducting in-Situ pavement tests including void content and unit weight
4. Preparing product samples (i.e., core or test panel)

If the installing contractor and concrete producer do not have sufficient experience with Ecocreto Pervious Concrete Pavement, the installing contractor shall retain an experienced consultant (as described above) to monitor production, handling, and placement operations at the contractor's expense.

1.4 Concrete Mix Design:

Contractor shall furnish a proposed mix design with proportions of materials to owner or agent prior to commencement of work. The data shall be provided by Ecocreto of Texas, Inc. to insure proper design for available aggregate in that region.

2.0 MATERIALS:

2.1 General:

Locally available material having a record of satisfactory performance shall be used.

2.2 Cement:

Portland Cement Type I or II conforming to ASTM C 150 or Portland Cement Type IP or IS conforming to ASTM C 595.

2.3 Aggregate:

Use Texas Department of Transportation (TXDOT) grade No. 8 coarse aggregate (3/8 to No. 16) per ASTM C 33; or No. 89 coarse aggregate (3/8 to No. 50) per ASTM D 448. If other gradation of aggregate is to be used, submit data on proposed material to Ecocreto of Texas, Inc for approval.

2.4 Admixtures:

Type "1" ECOCRETO™ Admixture

2.5 Water:

Potable or shall comply with TXDOT Standard Specifications

2.6 Base Material:

Base material must consist of a uniformly graded rock with 100% retained on ¾ inch sieve and 100% passing 1-1/2 inch sieve (ASTM C33, Specifications for Concrete Aggregates). All rock used as base material must be clean and durable with no fines. A minimum of five representative and random samples must be collected and tested for voids (ASTM C29, Test for Unit Weight and Voids in Aggregate). The test results must indicate a mean void ratio greater than 0.40 with 95% probability.

2.7 Geotextile Fabric

A layer of geotextile fabric with the following minimum specifications is to be placed on top of the natural subsoil prior to placing base material. The fabric should extend up the natural earth sides and over the top of any adjacent berm. The purpose of the fabric is to prevent migration of fine material from the subsoil into the gravel. Since the permeability of fabric is higher than typical soils in the Central Texas region, this fabric layer will not impede water flow.

Nonwoven Geotextile Fabric Specifications[1]

Property	Specification	Test Method
Unit Weight	20 oz/sq. yard	
Flow Rate	180 gpm/sq. ft (minimum)	
Permeability	12.4 x 10-2 cm/sec	ASTM D-2434
Grab Strength (fabric)	Long: 90 lbs dry 95 lbs wet Wide: 70 lbs wet or dry	ASTM D-1682
Puncture Strength (fabric)	42 lbs (minimum)	COE CW-02215
Mullen Burst Strength	140 psi (minimum)	ASTM D-1117
Equivalent Opening Size	100 (70 – 120)	US Standard Sieve
Flow Rate (drainage core)	14 gpm/ft width	Drexel University test method

2.8 Subsoil

Because natural soil permeability is variable, the Ecocreto® pavement system is designed to function over a wide range of soil permeabilities by spreading storm water over a sufficiently large area.

The subsoil must be natural soil without waste, debris, or material that might leach chemicals into the subsurface. If fill material is required below the pavement, it must be clean and free of deleterious material. It must meet all geotechnical specifications for structural support.

[1] Based on City of Austin Environmental Criteria Manual.

3.0 PROPORTIONS:

3.1 Cement Content:

For pavements subject to vehicular traffic loading, the total cementitious material shall not be less than 564 lbs. per cubic yard

3.2 Aggregate Content:

The volume of aggregate per cubic yard shall be equal to 27 cubic feet when calculated as a function of the unit weight determined in accordance with ASTM C 29 jigging procedure.

3.3 Admixture:

Shall be used in accordance with Ecocreto's instructions and recommendations.

3.4 Mix Water:

Mix water quantity shall be such that the cement paste displays a wet metallic sheen without causing the paste to flow from the aggregate. (Mix water quantity yielding a cement paste with a dull-dry appearance has insufficient water for hydration.)

A. Insufficient water results in inconsistency in the mix and poor aggregate bond strength.

B. High water content results in the paste sealing the void system primarily at the bottom and poor aggregate surface bond.

4.0 SUBGRADE PREPARATION AND FORMWORK:

4.1 Subgrade:

The subsoil shall be prepared by removing all surface vegetation and soil to final subsoil grade. The subsoil surface beneath infiltration areas must be level and proof-rolled with minimum compaction to eliminate soft or wet areas. Deviation from profile grade must be less than 3 inches in 100 feet (0.25%).

The subgrade must not be compacted or subjected to construction vehicle traffic prior to the placement of based. Subgrade work must be sequenced to minimize passes of construction vehicles in the beds themselves. If the excavated subgrade is exposed to rainfall runoff, it may accumulate fines. These must be removed prior to geotextile fabric and base placement. Grading should not occur during wet soil conditions to minimize smearing and sealing of the soil surface. If such sealing occurs, the surface must be scarified to restore natural texture and permeability.

4.2 Geotextile Fabric

Geotextile fabric must be placed according to manufacturer's directions and overlap a minimum of 18 inches. The geotextile fabric is to extend up the sides of the pavement excavation area and at least 5 feet beyond the top of the berm. The geotextile fabric must be carefully placed and anchored.

4.3 Base Material:

Immediately following placement of the filter fabric, base material shall be placed in 8-inch lifts. Base placement is to start at one edge of the bed and move across the bed surface. Loaded stone trucks should drive only across stone that has already been dumped and not across the geotextile fabric-covered subgrade. The surface of the base material should be approximately parallel to the final design pavement grade.

4.4 Forms:

Forms may be of wood or steel and shall be the depth of the pavement. Forms shall be of sufficient strength and stability to support mechanical equipment without deformation of plan profiles following spreading, strike-off and compaction operations.

5.0 MIXING, HAULING AND PLACING:

5.1 Mix Time:

Truck mixers shall be operated at the speed designated as mixing speed by the manufacturer for 75 to 100 revolutions of the drum. Add Ecocreto™ and mix a minimum of 40 revolutions or to required consistency.

5.2 Transportation:

The Portland Cement Aggregate mixture may be transported or mixed on the site and should be used within one (1) hour of the introduction of mix water, unless otherwise approved by an engineer.

5.3 Discharge:

The contents of each mixer truck must be inspected for appearance of concrete uniformity according to Section 304. Water may be added to obtain the required mix consistency. A minimum of 20 revolutions at the manufacturer's designated mixing speed shall be required following any addition of water to the mix. Discharge shall be continuous operation and shall be completed as quickly as possible.

5.4 Placing and Finishing Equipment:

Unless otherwise approved by the manufacturer, the contractor shall provide mechanical equipment of either slip form, vibrator screed or vibrator plate with minimum of 10-psi vertical force. The pervious concrete pavement will be placed to the required cross section and shall not deviate more than +- 3/8 inch in 10 feet from profile grade. If placing equipment does not provide the minimum specified vertical force, a full width roller or other full width compaction device that provides sufficient compactive effort shall be used immediately following the strike-off operation. After mechanical or other approved strike-off and compaction operation, no other finishing operation will be allowed. If internal or surface applied vibration is used, it shall be shut off immediately when forward progress is halted for any reason. The contractor will be restricted to pavement placement widths of maximum of fifteen (15) feet unless the contractor can demonstrate competence to provide pavement placement widths greater than the maximum specified to the satisfaction of the engineer.

5.5 Curing:

Curing procedures shall begin within 20 minutes after the final placement operations. The "ECOCRETO™" pavement surface shall be covered with a minimum six- (6) mil thick polyethylene sheet or other approved covering material. Prior to covering, a fog or light mist shall be sprayed above the surface when required due to ambient conditions (temperature, wind, and humidity). The cover shall overlap all exposed edges and shall be secured (without using dirt or stone) to prevent dislocation due to winds or adjacent traffic conditions.

5.6 Jointing:

Transverse control (contraction) joints shall be installed at 20-foot intervals. They shall be installed at a depth of ¼ the thickness of pavement. Longitudinal control joints shall be installed at the midpoint if the constructed lane width exceeds 15 feet. These joints can be installed in the plastic concrete or saw cut. The procedure should begin as soon as the pavement has hardened to prevent reveling and uncontrolled cracking (normally after curing). Transverse construction joints shall be installed whenever placing is suspended a sufficient length of time that concrete may begin to harden. In order to assure aggregate bond at construction joints, a binding agent suitable for bonding fresh concrete to existing concrete shall be brushed, rolled, or sprayed on the existing pavement surface edge. Isolation (expansion) joints will not be used except when pavement is abutting slabs or other adjoining structures.

6.0 TESTING, INSPECTION AND ACCEPTANCE:

6.1 Independent Testing Laboratory:

The owner will retain an independent testing laboratory. The testing laboratory shall conform to the applicable requirements of:

- ASTM E 329, Standard Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction;
- ASTM C 1077, Standard Practice for Testing Concrete and Concrete Aggregates for Use in Construction, and Criteria for Laboratory Evaluation; and
- Shall be inspected and accredited by the Concrete Advisory Board of Georgia, Inc. or by an equivalent recognized national authority.

The agent of the testing laboratory performing field sampling and testing for concrete shall be certified by the American Concrete Institute as a Concrete Field Testing Technician Grade I, or by a recognized state or national authority of an equivalent level of competence.

6.2 Subgrade Permeability and Soil Tests:

Where the Ecocreto pavement system is proposed for water quality treatment or flood control by subsoil infiltration, measurements of subsoil permeability, grain size distribution, and Atterberg limits are required. Soil exploration must also demonstrate a minimum of 18 inches of subsoil below the base material at every sample location.

Subsoil permeability may be measured either in the laboratory or field. Laboratory permeability tests will not measure permeability associated with macroporosity and, in general, produce lower permeability values.

Soil tests must be conducted on the greater of 2 samples for each identified soil type, or 1 sample per 50,000 square feet of infiltration area. Alternatively, permeability tests sufficient to establish a mean permeability at least as large as the design rate with 95% confidence is acceptable.

Undisturbed soil samples for laboratory measurement shall be collected according to the standards of ASTM D 4700-91 Guide for Soil Sampling from the Vadose Zone. Samples are not to be recompacted or reformed. Laboratory measurements of hydraulic conductivity will be made using a permeameter or triaxial cell apparatus. Care must be taken to avoid high-pressure gradients that might cause Darcy's law to become invalid due to turbulence or result in hydraulic piping along the specimen sides. The sample should be flushed with carbon dioxide prior to flooding with water. Water flooding shall begin from the bottom of the sample to displace entrapped air.

6.3 Concrete Inspection and Acceptance:

A minimum of one test for each day's placement of pervious concrete in accordance with ASTM C 172 AND ASTM C 29 to verify unit weight shall be conducted. Delivered unit weights are to be determined in accordance with ASTM C 29 using 0.25 cubic foot cylindrical metal measure. The measure is to be filled and compacted in accordance with ASTM C 29 paragraph 11, jigging procedure. The unit weight of the delivered concrete shall be +- five (5) pcf of design weight.

Test panels shall have two cores taken from each panel in accordance with ASTM C 42 at a minimum of seven days after the placement of the pervious concrete. The cores shall be measured for thickness, void volume, and unit weight. Untrimmed, hardened core samples shall be used to determine placement thickness. The average of all production cores shall not be less than the specified thickness with no individual core being more than ½ inch less than the specified thickness. After thickness determined, the cores shall be trimmed and measured for unit weight in the saturated condition as described in paragraph 6.3.1 "Saturation" of ASTM C 140, Standard Methods of Sampling and Testing Concrete Masonry Units. The trimmed cores shall be immersed in water for 24 hours, allowed to drain for one (1) minute, surface water removed with a damp cloth, then weighed immediately. The range of satisfactory unit weight values is +- five (5) pcf of the design unit weight.

After a minimum of seven (7) days following each placement, three cores shall be taken in accordance with ASTM C 42. The core shall be measured for thickness and unit weight determined as described above for test panels. Core holes shall be filled with concrete meeting the pervious mix design.

7.0 MAINTENANCE, CLOGGING, SPECIAL RECOMMENDATIONS

7.1 Maintenance

The finished & cured Ecocreto™ admixture pavement requires specific maintenance in order to maintain permeability. It is recommended that the surface be vacuumed at least 2 times per year, on six-month intervals, to lift any silt or debris from the surface. This process will prevent clogging of the pervious system. Frequency may be increased due to over hanging vegetation and or excessive dirt & pollutants, which may wash into or over & foul the surface of the pervious system

Power washing is also recommended on an annual basis, but not limited to annually, in order to flush silt or other contaminants, which is essential to maintaining the permeability of the system. It has been determined that these fines cause little to no threat to the system when washed into the lower & larger aggregate.

7.2 Clogging & Prevention

The largest clogging threats to the system occur during construction and from landscape. During initial or remodeling construction, contractors may use pavement areas to store materials such as sand, gravel with fines, soil or landscape materials containing fines. The owner or supervising contractor must require all contractors to protect the pavement using Heavy Visqeen or plywood under such piles and to cover all piles to prevent blowing and or washing away of such materials.

The near proximity of the landscape ground covers such as mulch, dirt or other fine materials also represents a risk of clogging. Buoyant fines may float during heavy rain showers or during watering. Heavier fines may be washed onto the pavement from storm runoff.

The Ecocreto pavement system must be protected from landscape clogging by either grading to prevent run-on to the pavement, or by adding a filtering area between any mulch or dirt surface and the pavement. The filter area may be any well-vegetated surface, including turf. A combination of grading to prevent run-on and a filter area provides the best assurance of long-term system permeability and functionality.

Because of the necessity of on-going maintenance, the manufacturer and/or installation contractor cannot and will not assume any liability regarding long-term pavement permeability.

7.3 Recommendations:

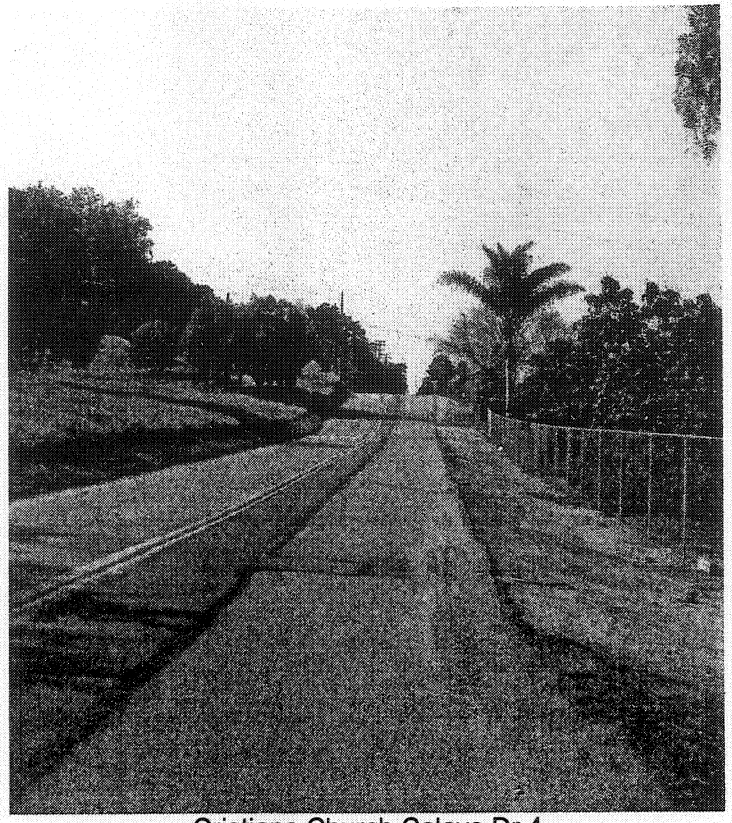
It is strongly recommended/encouraged that signs are posted in landscape areas and at entrances to the property as reminders of an ecologically sensitive pavement structure and that certain guidelines must be adhered to including but not limited to:

- No piling of dirt, sand, gravel or landscape material without covering the pavement first with a durable cover to protect the integrity of the pervious surface.
- All landscape cover must be graded to prevent washing and or floating of such materials onto or through the pervious surface.
- All chemical spills inclusive but not limited to petrochemicals, hydrocarbons, pesticides and herbicides should be reported to the owner so they can prevent uncontrolled migration. Chemical migration control may require flushing, and/or the introduction of microbiological organisms to neutralize any impacts to the soil or water.

These are some but may not be all areas of concern, which are recommended that ownership of such properties post to protect and prevent contamination of the pervious ecological system.

PHOTOS

Cristiano Church



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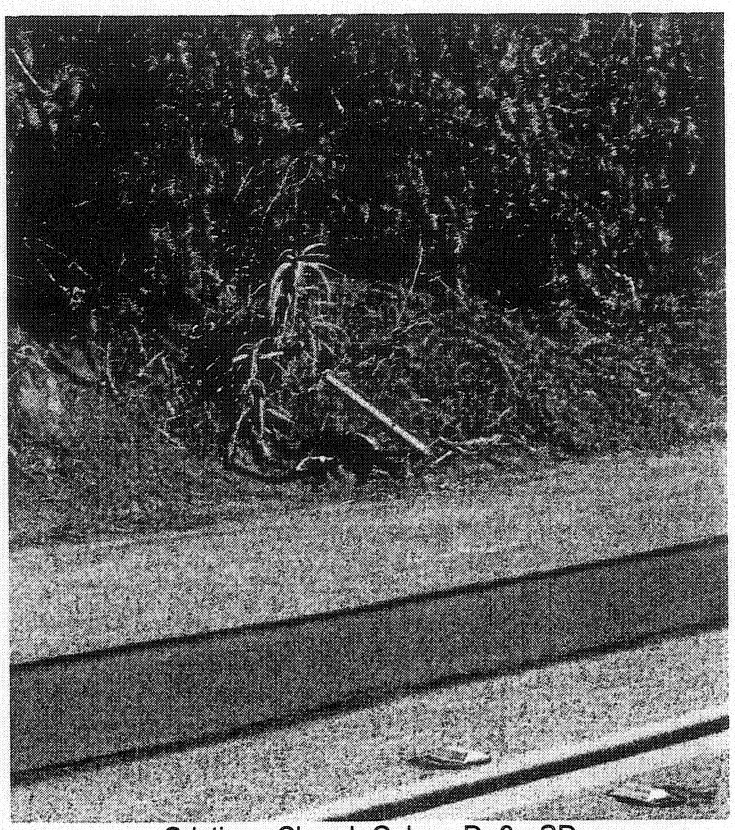

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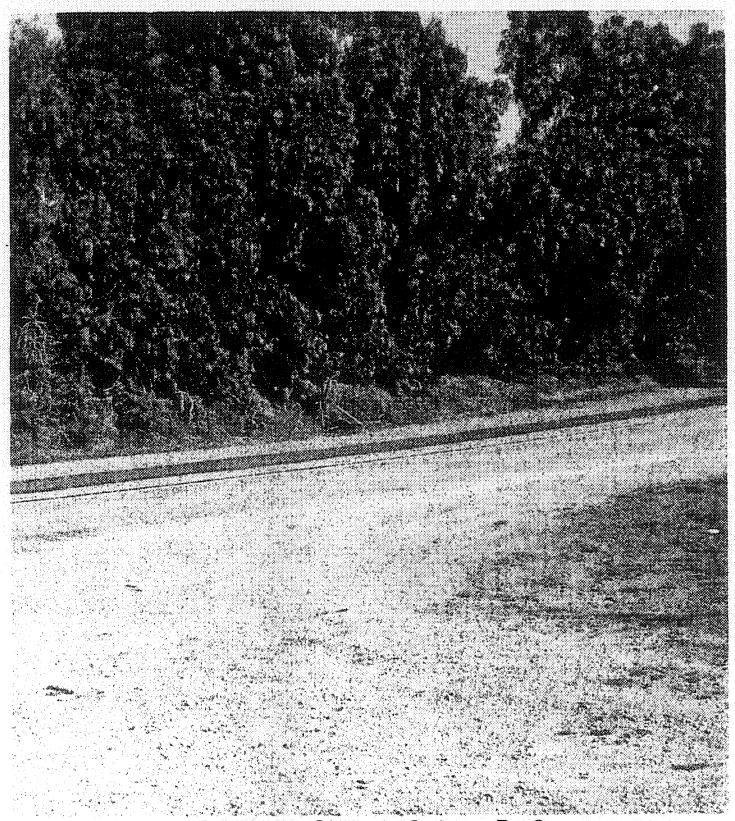
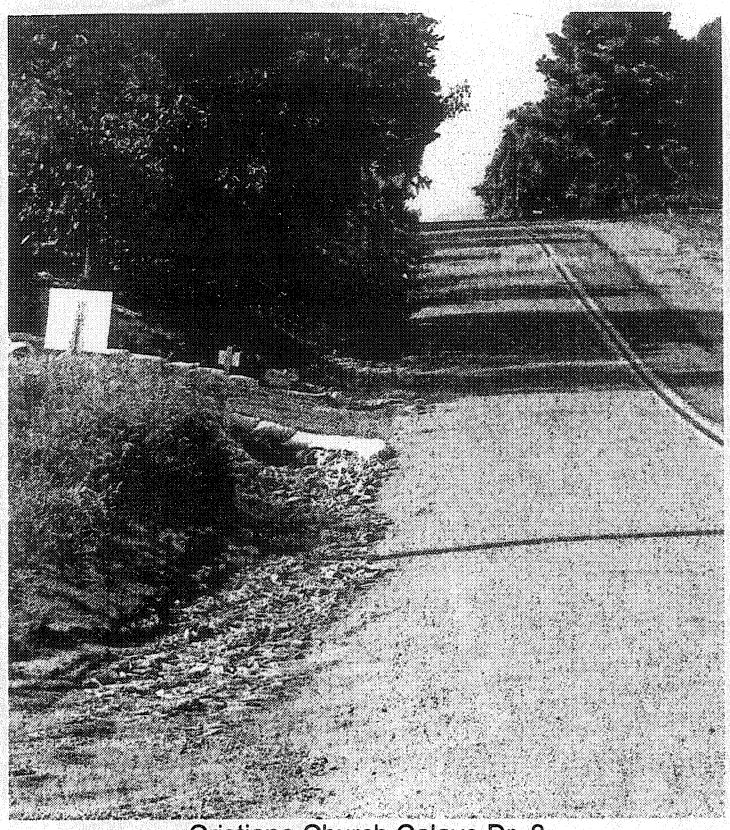


Cristiano Church Calavo Dr.2

Cristiano Church Calavo Dr



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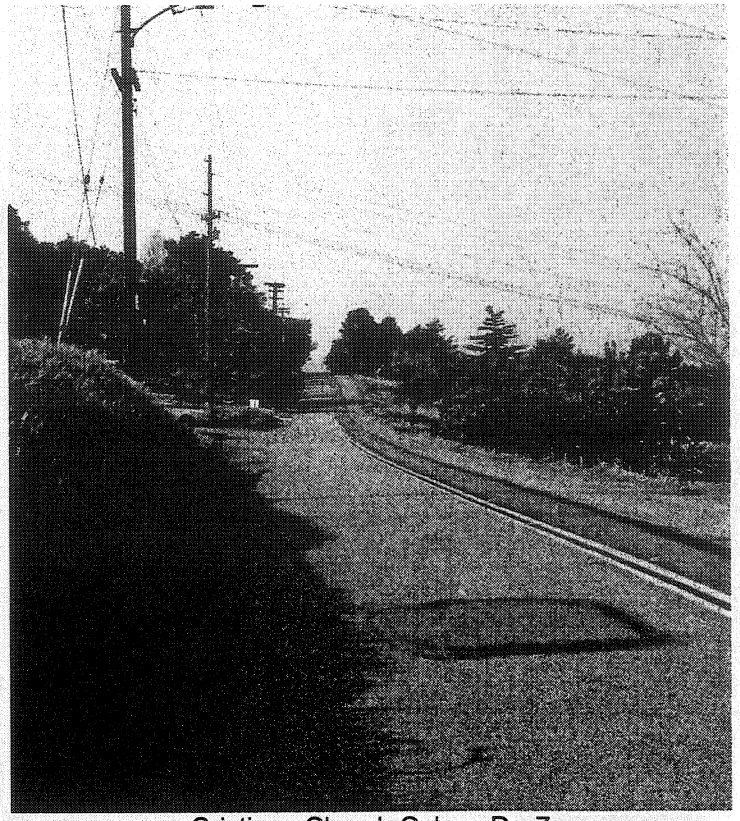

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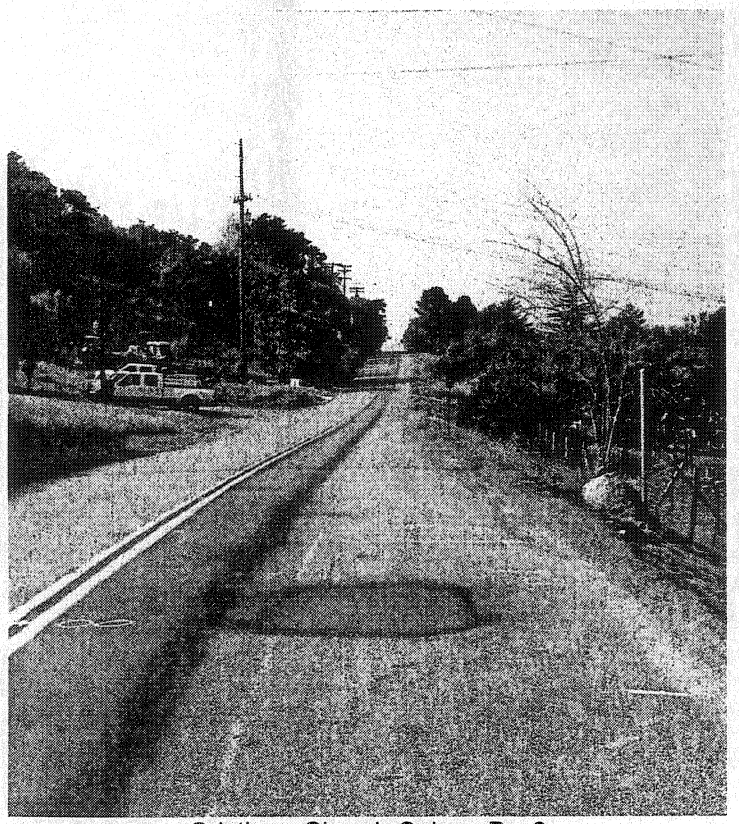

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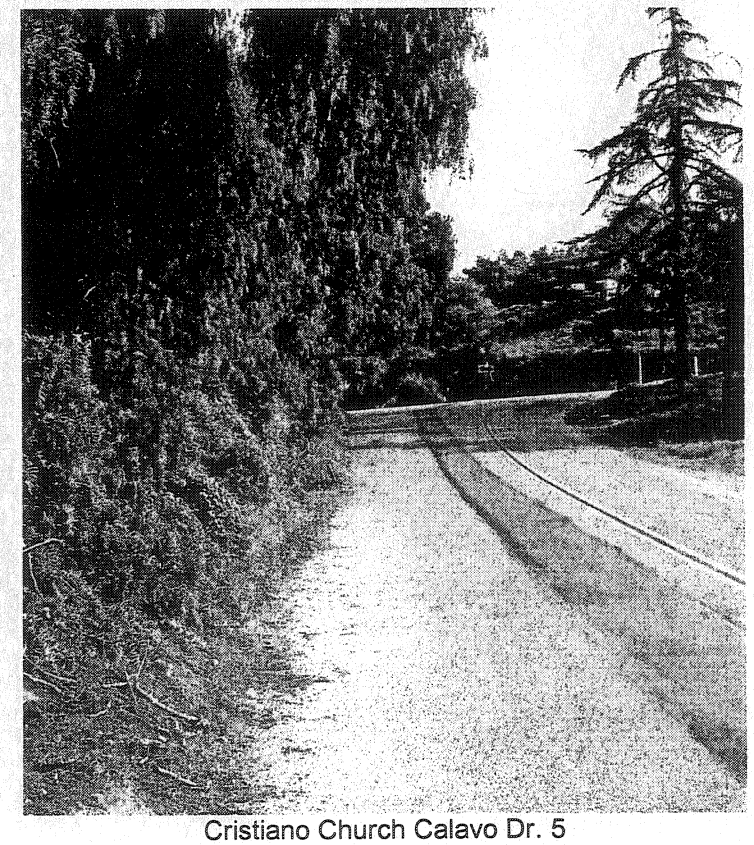
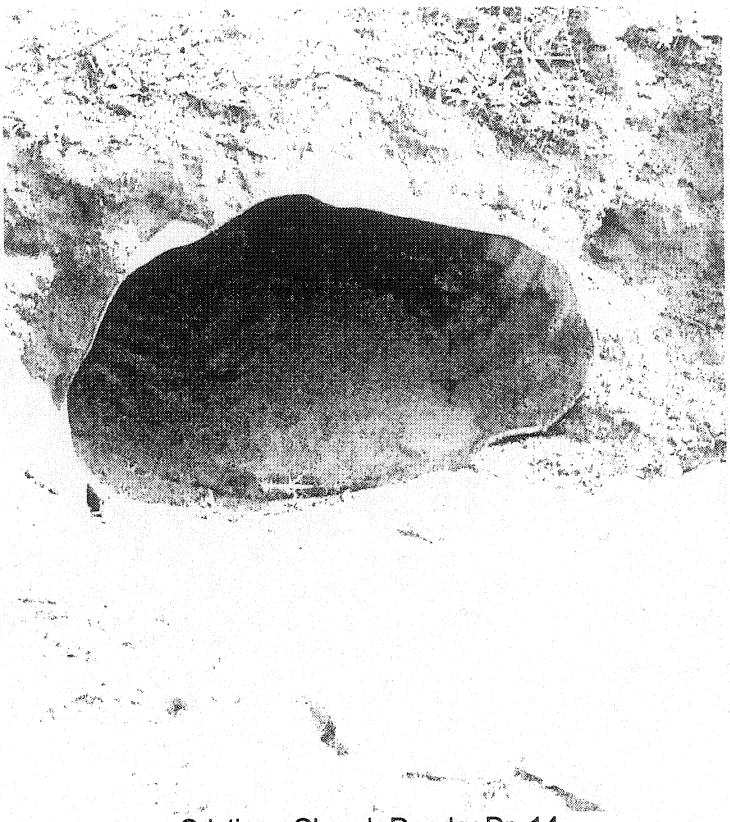


Cristiano Church Calavo Dr. 5

Cristiano Church

Cristiano Church Site 2



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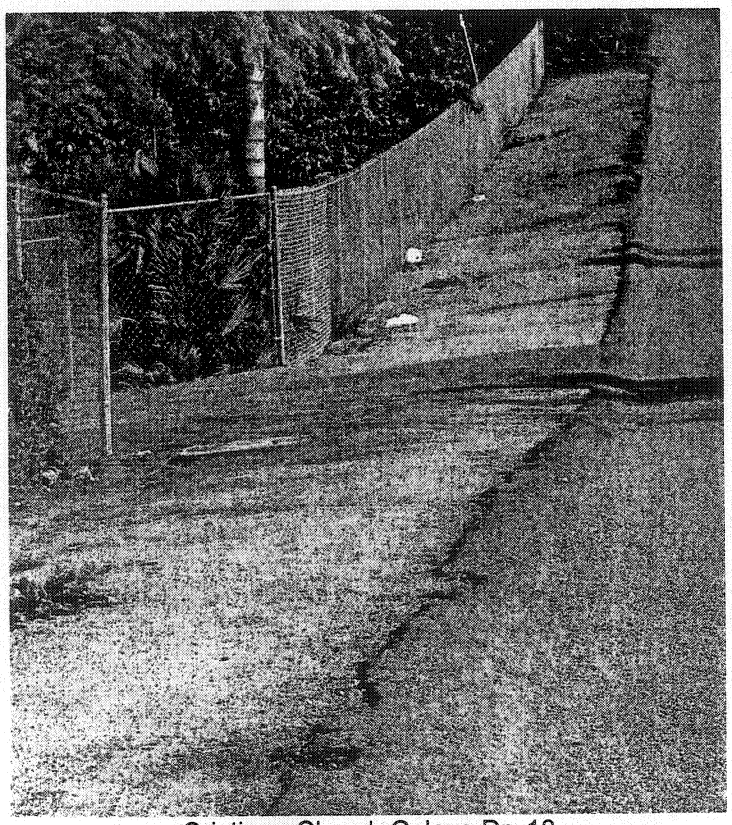

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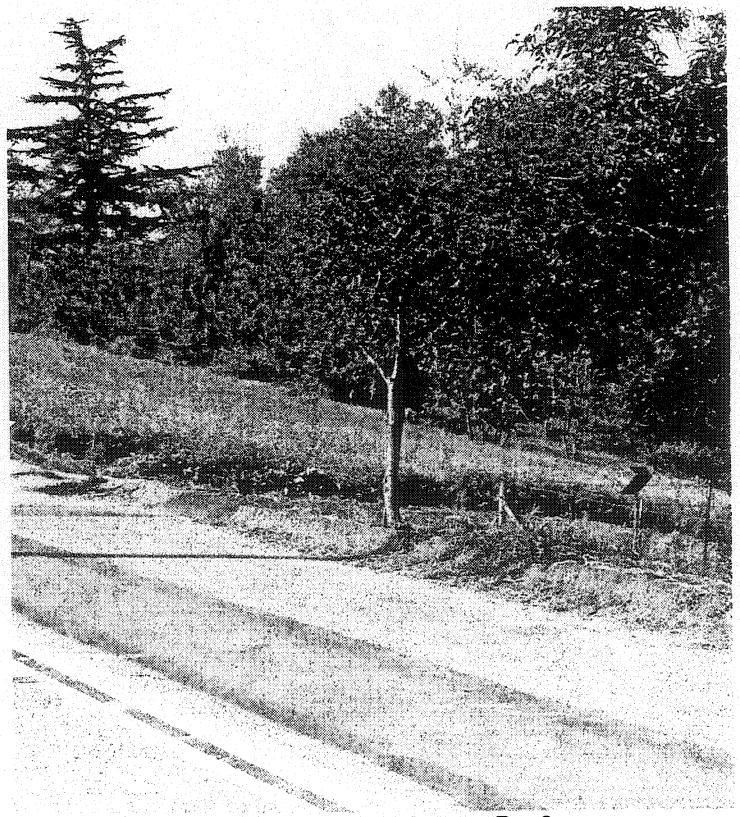

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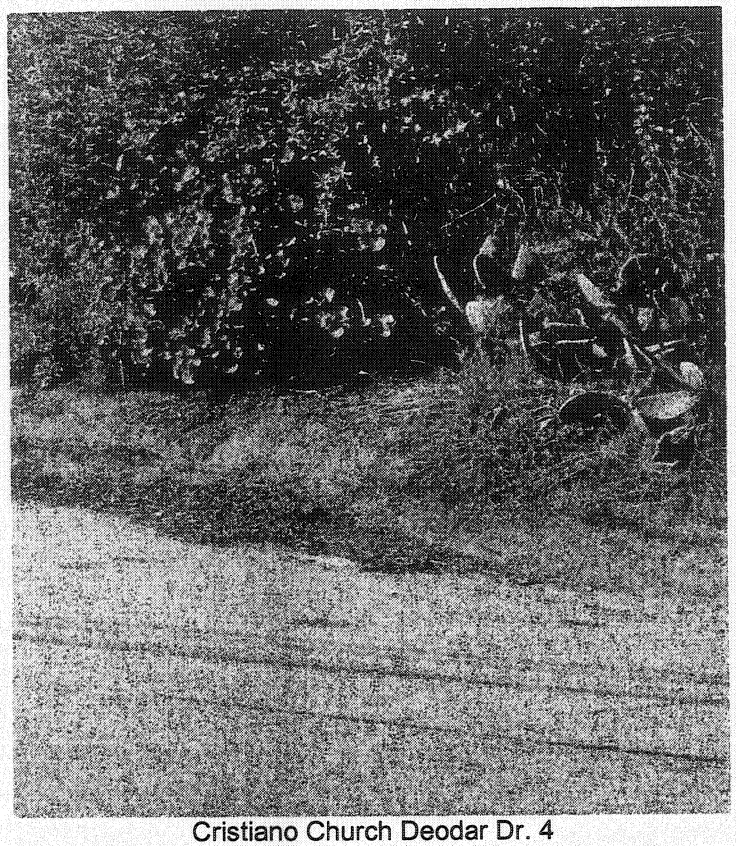
Cristiano Church



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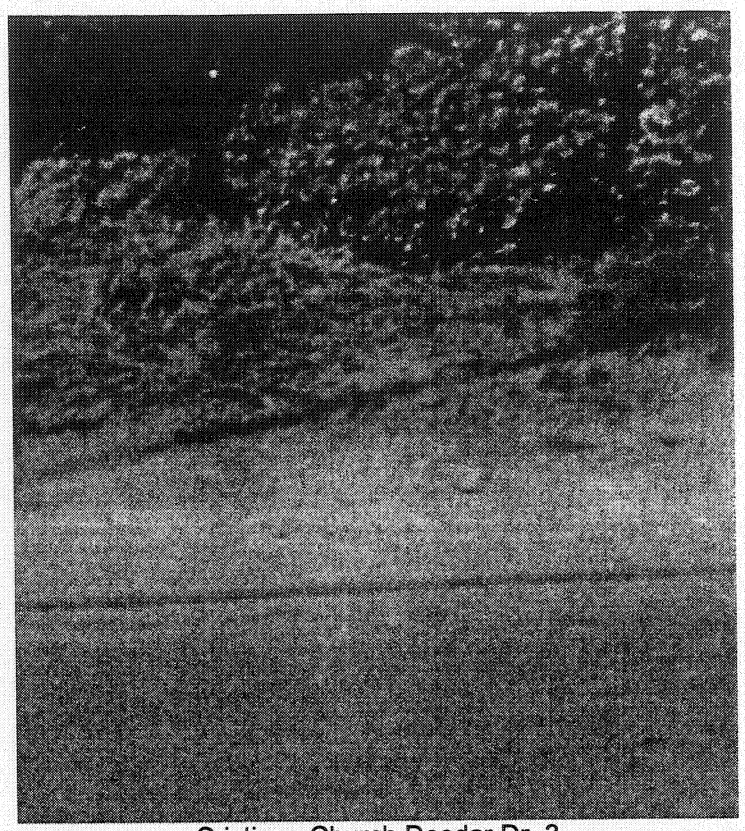

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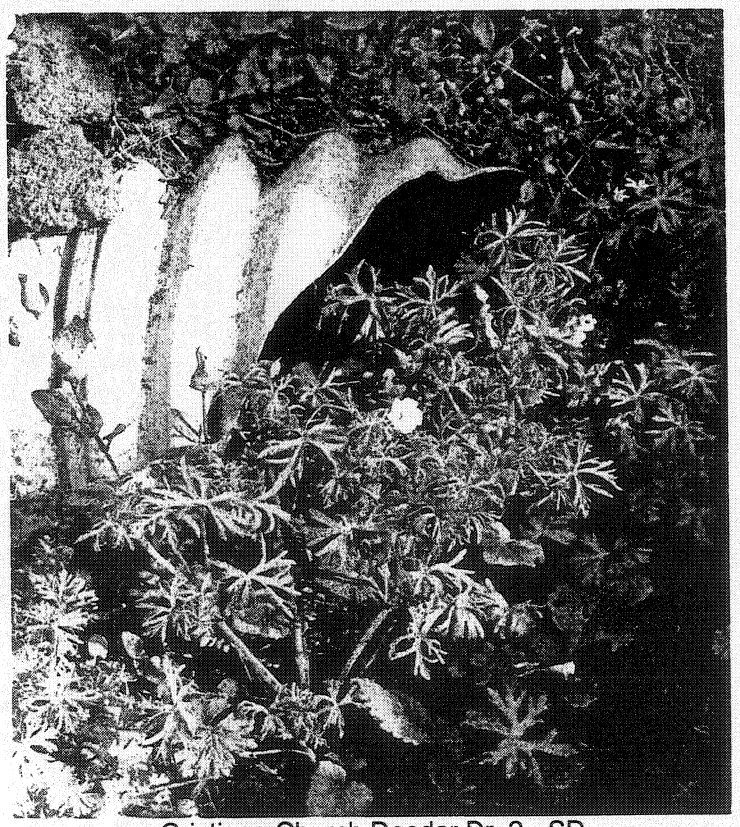

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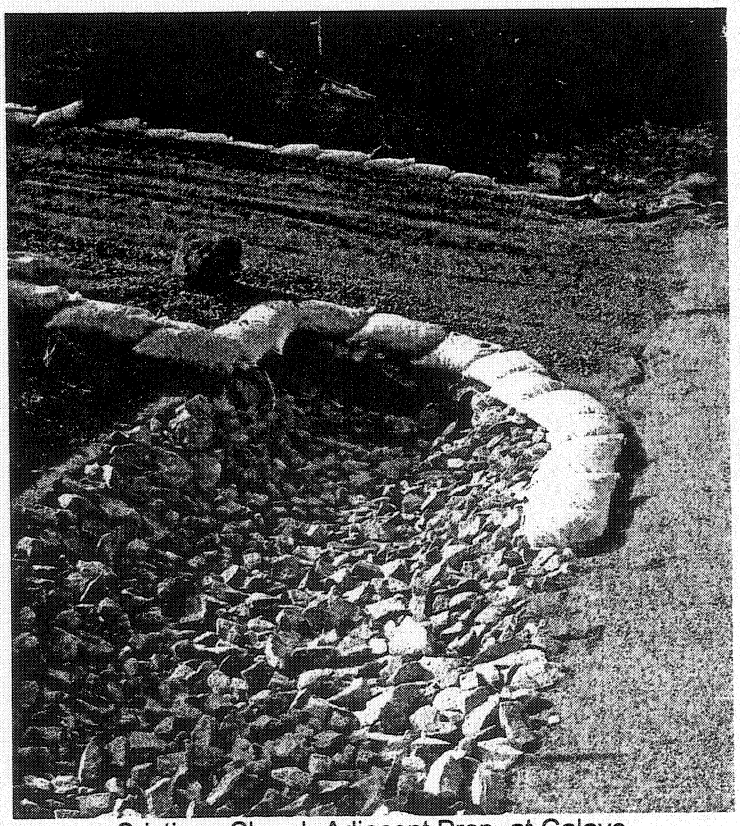
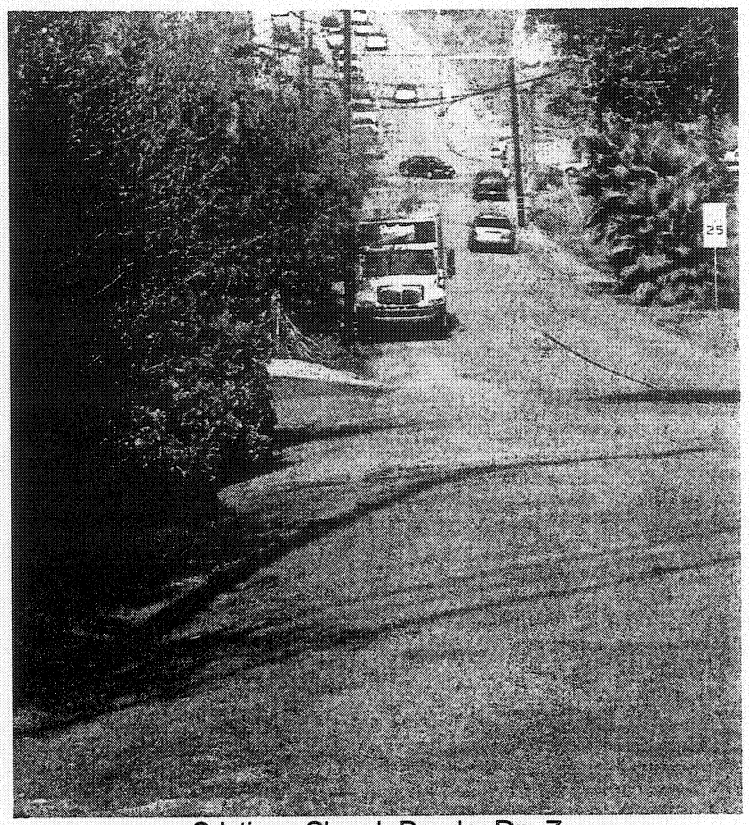
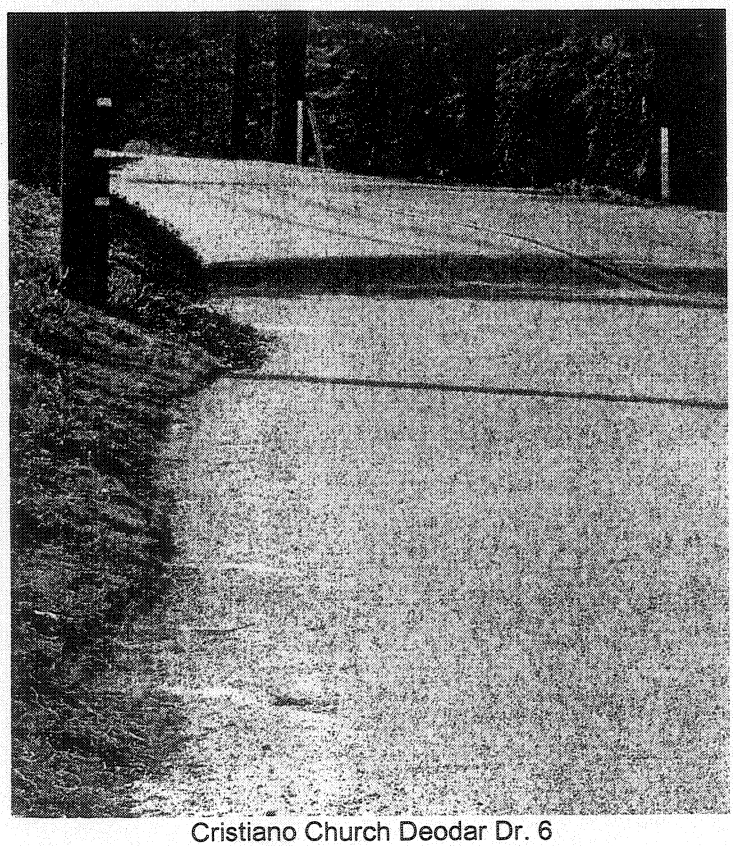


Cristiano Church Adjacent Prop. at Calavo

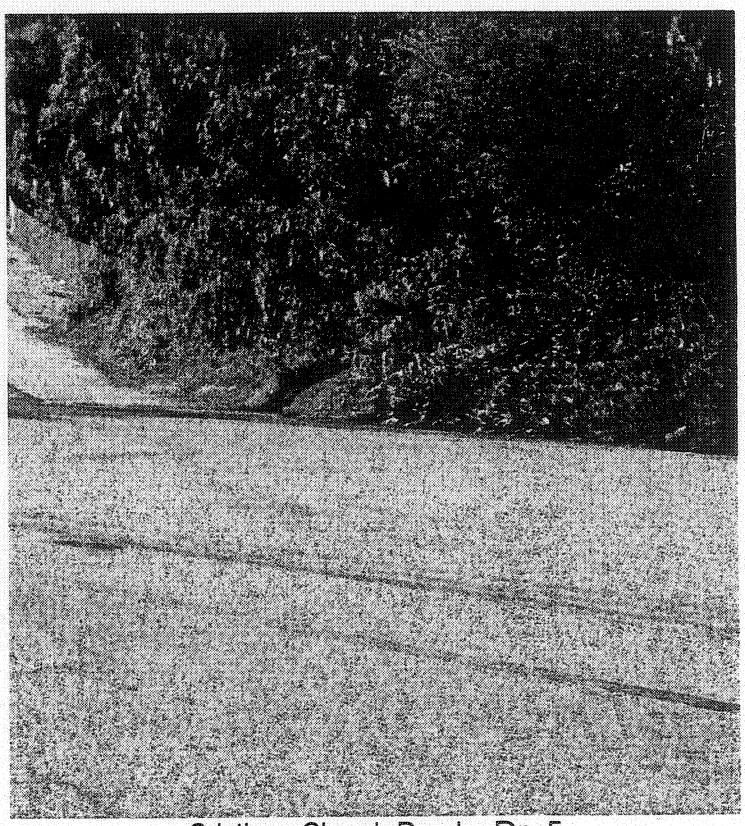
Cristiano Church Deodar Dr. 8



Cristiano Church Deodar Dr. 7



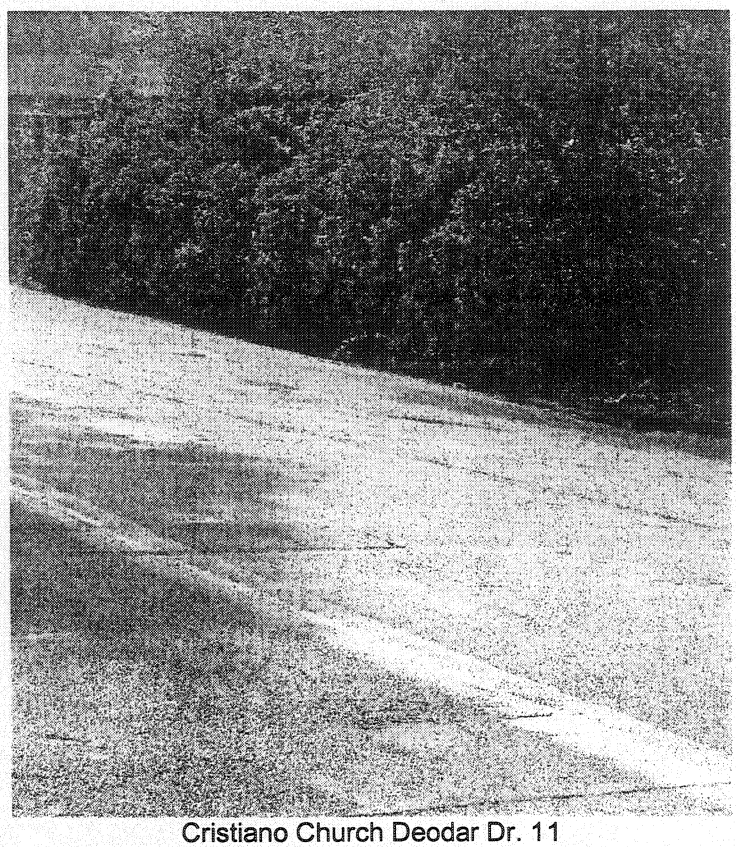
Cristiano Church Deodar Dr. 6



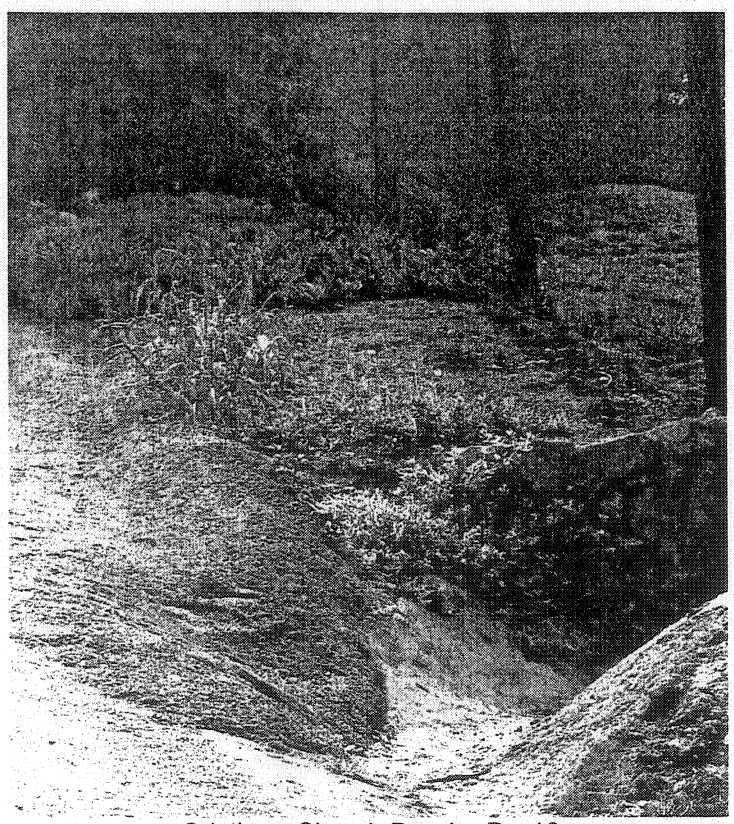
Cristiano Church Deodar Dr. 5

Cristiano Church

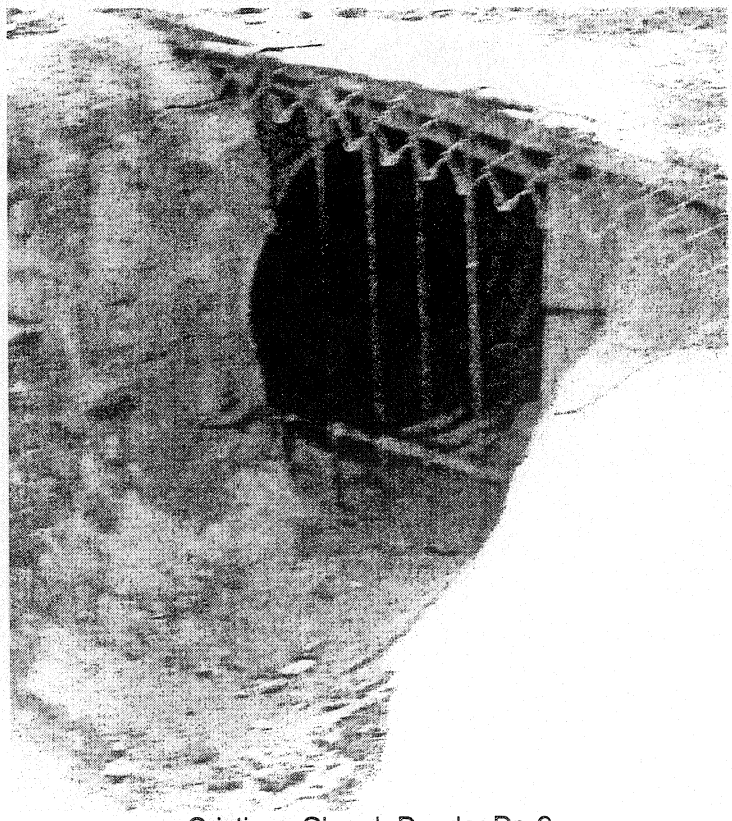
Cristiano Church Site



Cristiano Church Deodar Dr. 11

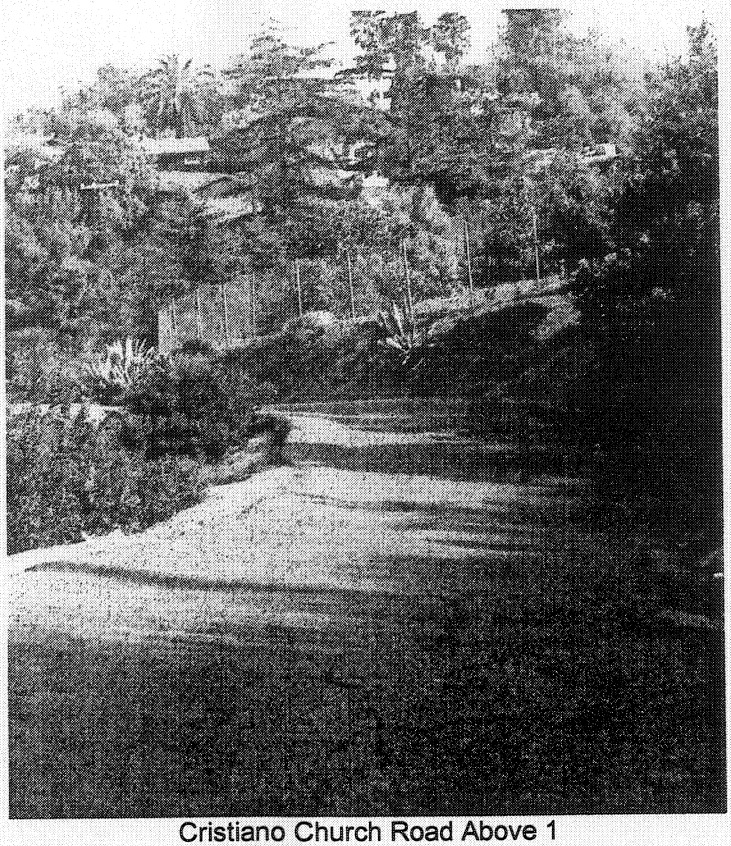


Cristiano Church Deodar Dr. 10

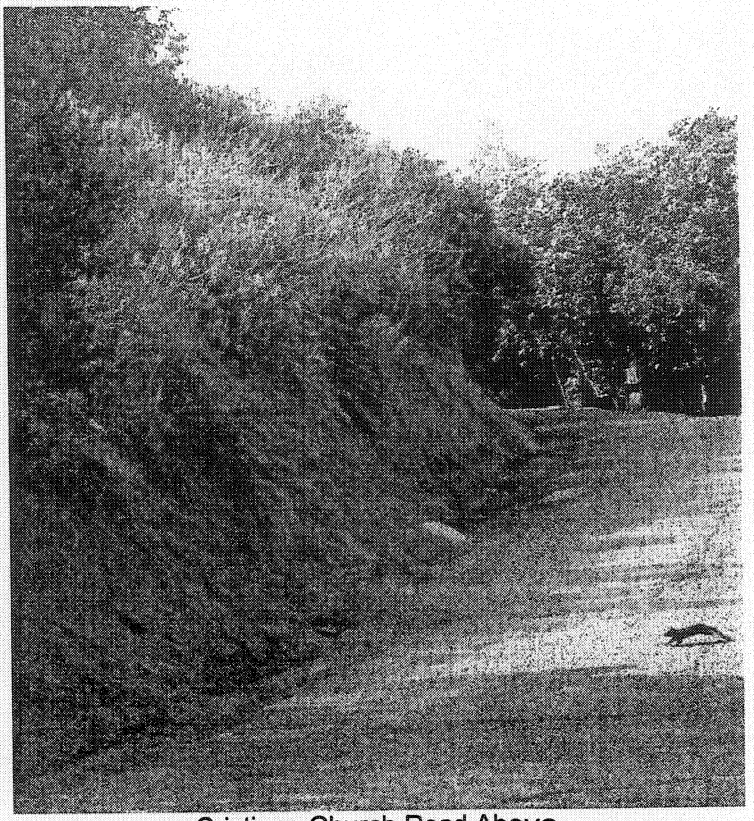


Cristiano Church Deodar Dr. 9

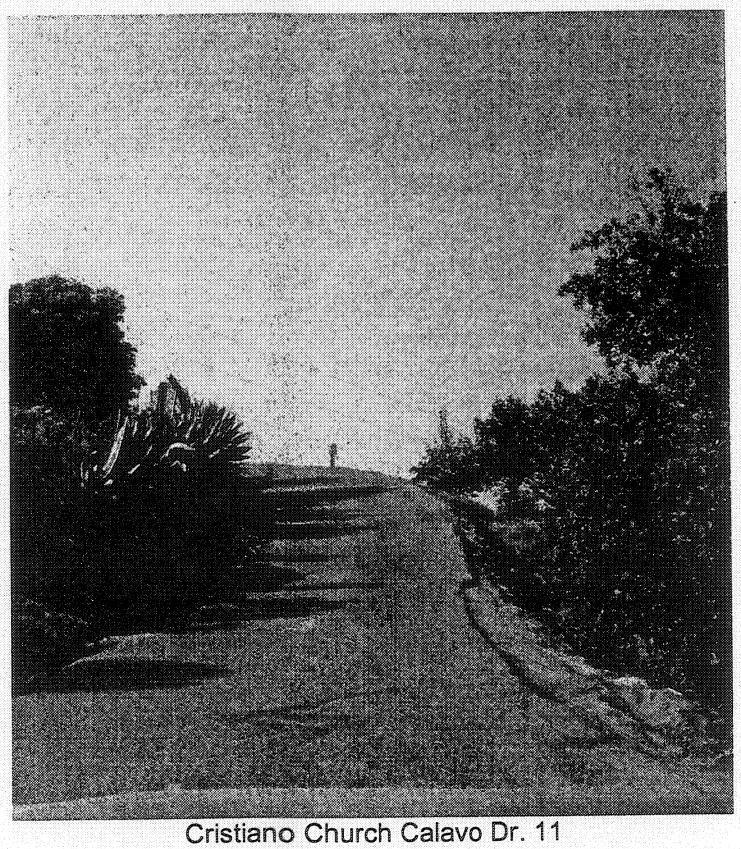
Cristiano Church



Cristiano Church Road Above 1



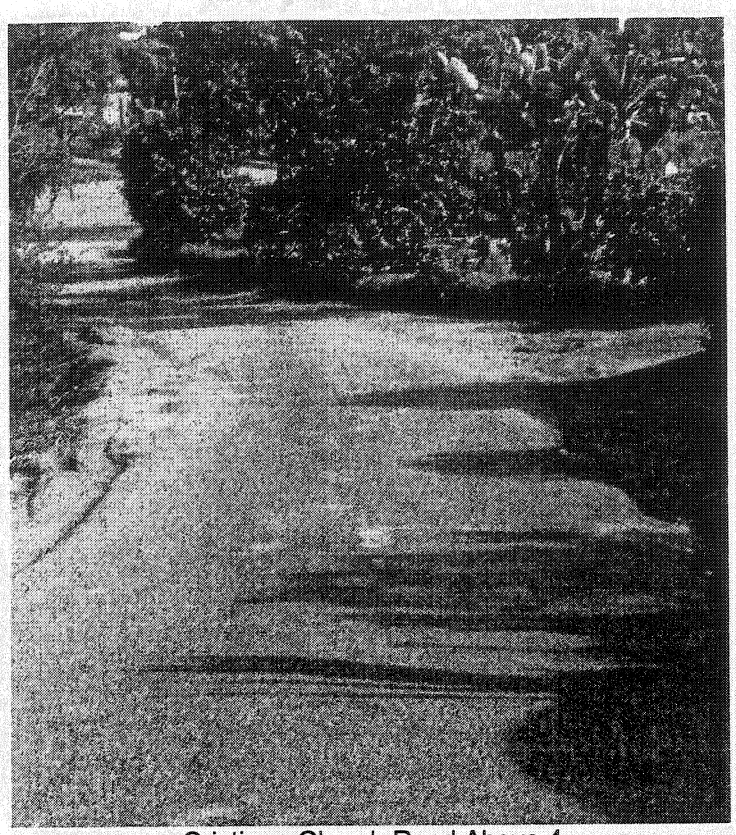
Cristiano Church Road Above



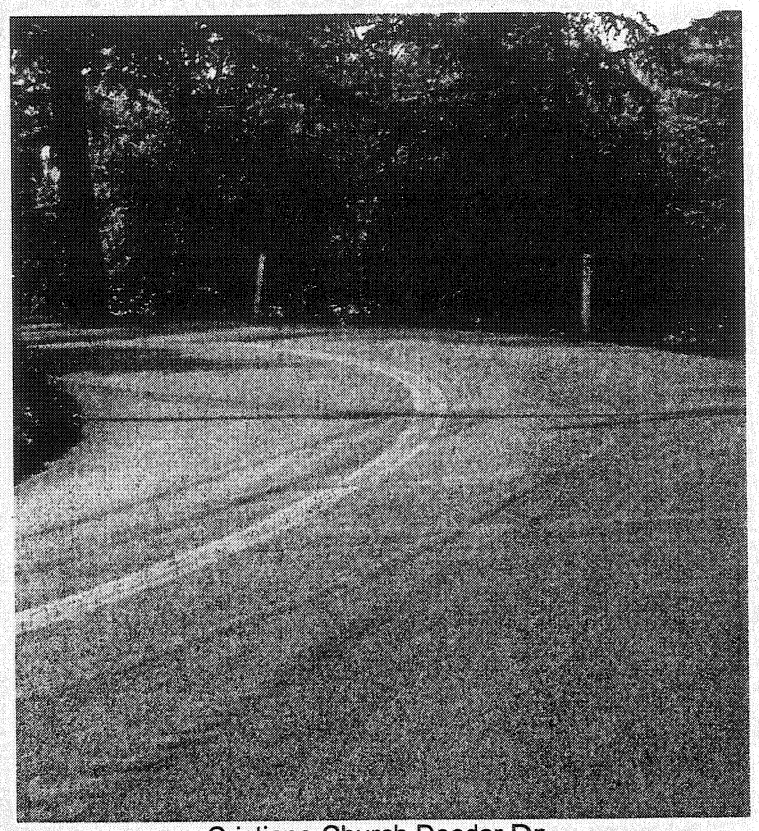
Cristiano Church Calavo Dr. 11

Cristiano Church SDGE at Calavo 3

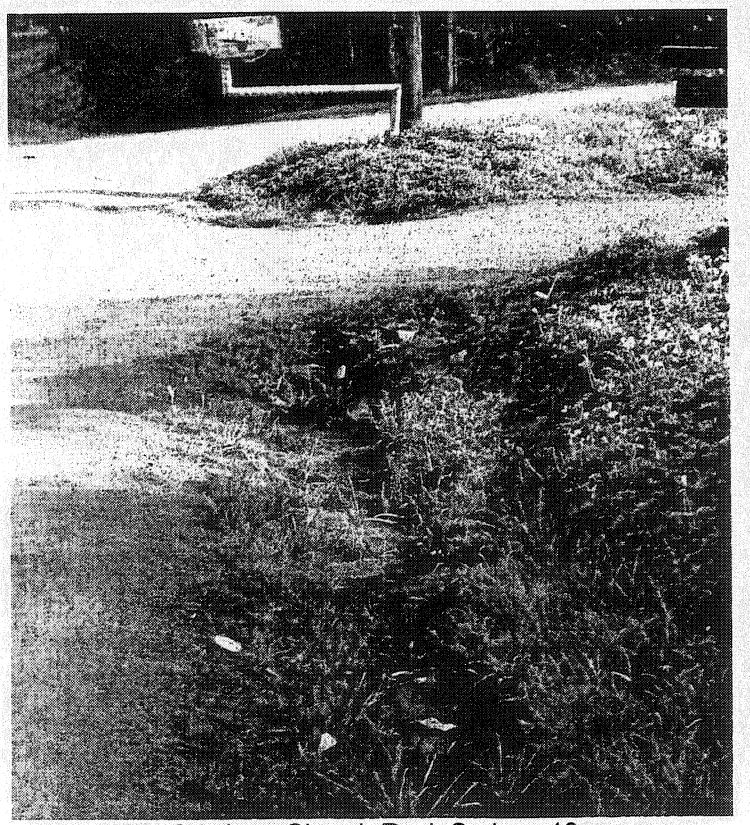
Cristiano Church



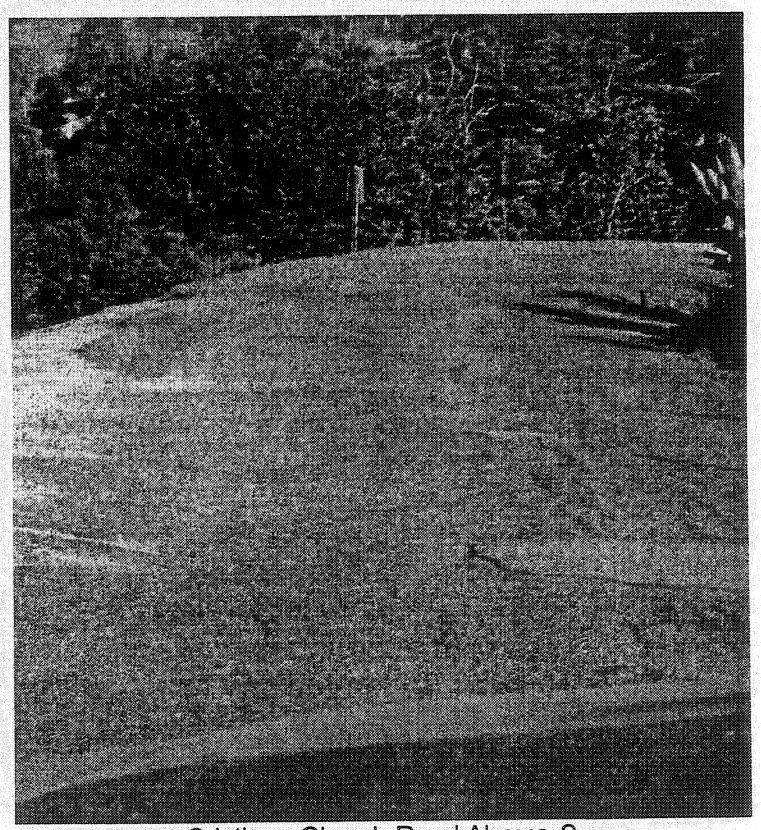
Cristiano Church Road Above 4



Cristiano Church Deodar Dr.



Cristiano Church Rock Springs 10



Cristiano Church Road Above 2